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EXPRO 73

A Listing of Extramural Projects to be Funded in Fiscal Year 1973

Environmental Protection Agency

OCTOBER 1972

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EXPRO '73

A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1973

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OFFICE OF RESEARCH AND MONITORING
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FOREWORD

I am very pleased to issue this first edition of "EXPRO" — the Office of Research and Monitoring's **EX**tramural **PRO**gram Information Bulletin. **EXPRO** is meant to inform you as to how to "do business" with the Office of Research and Monitoring and to provide you with a listing of "Tasks" planned to be funded as research and demonstration projects by this Office during each Fiscal Year.

We greatly need the best available talent of the academic, scientific and industrial community to be applied to the difficult and complex research problems in the field of environmental quality. In the past, it has often been difficult to obtain comprehensive and up-to-date information regarding the research needs and interests of the Environmental Protection Agency. **EXPRO** should alleviate this difficulty by providing information to all interested parties regarding the subjects and goals of individual grant and contract tasks planned for the current Fiscal Year.

Stanley M. Greenfield
Assistant Administrator for
Research and Monitoring

EXPRO '73
OFFICE OF RESEARCH and MONITORING
EXTRAMURAL PROGRAM INFORMATION BULLETIN
FISCAL YEAR 1973

Environmental Protection Agency's Office of Research and Monitoring (OR&M) conducts and supports research, development and demonstration efforts on a wide variety of subjects primarily related to pollution sources and effects, environmental sciences and pollution control technology. OR&M also is responsible for assuring the quality control and standardization of analytical techniques for the Environmental Protection Agency as well as promoting, through technology transfer, the use of new techniques, processes, methodologies, etc., in pollution control.

EPA was formed in late 1970 from programs in a number of executive agencies — e.g., the Department of Health, Education and Welfare (air, solid waste, radiation, water hygiene and noise), the Department of the Interior (water, hazardous materials, and agricultural practices) and the Department of Agriculture (pesticide regulation). Research and demonstration grants and contracts were supported by many of the precursor programs under guidelines of their respective Departments. With the melding of these programs into a single Agency, the extramural activities in support of research and development have likewise been integrated.

The purpose of EXPRO is two-fold: (1) to acquaint the research and development community with general guidelines for working with the Environmental Protection Agency's Office of Research and Monitoring under grant or contract support; and (2) to make publically available a list of specific grant and contract Tasks which OR&M plans to fund during the current Fiscal Year. The Task list will be up-dated quarterly (at least initially) and will include only those Tasks for which a grantee or contractor has not already been selected and for which current-year funds remain available. Such a list will, therefore, present the most accurate picture of the Tasks for which EPA seeks new proposals at any given time.

Although grants and contracts are authorized under various pieces of legislation*/, the general procedures for seeking support have been unified to those discussed below.

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*/See Appendix A for citations of legislative authority and the conditions, limitations, etc. related thereto.

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PART I

GENERAL GUIDELINES FOR DEVELOPING GRANT OR CONTRACT PROJECTS

OR&M Objectives and Organization

The Office of Research and Monitoring establishes its objectives and priorities in response to the over-all mission and priorities of EPA and is highly mission-oriented, concerned with solving priority problems rather than merely advancing scientific knowledge. Although the scopes of OR&M projects may vary from quite fundamental research to the full-scale engineering demonstration of new pollution control processes, all projects are directed at meeting specified objectives. Grant and contract proposals will, therefore, be evaluated in the context of pre-established work plans.

The OR&M planning process places program definition responsibility in Headquarters and program execution responsibility in the National Environmental Research Centers (NERC's) at Cincinnati, Ohio; Corvallis, Oregon; Las Vegas, Nevada; and Research Triangle Park, North Carolina**/. In both the program definition and program execution process, OR&M activities are grouped into a number of discrete subject categories or "Program Elements". Responsibility for managing all activities within a given Program Element is held by a designated "Program Element Manager" or "PEM" at Headquarters; his counterpart in one of the NERC's is designated the "Program Element Director" or "PED". The PEM is responsible for establishing the objectives and priorities within the Program Element, for allocating to the PED the resources necessary to implement the planned program and for monitoring over-all Program Element progress. The PED is responsible for project planning and for directing the efforts to achieve assigned objectives through use of his own research staff as well as through the development and award of contracts and grants. Narrative descriptions of all OR&M's Program Elements and the names and locations of corresponding PEM's and PED's are provided in Part II.

In addition to OR&M's Headquarters and laboratory personnel, each EPA Regional Office employs one or more staff members designated as Regional Research and Monitoring Representatives. These individuals, see Appendix C, assist OR&M in identifying research needs of importance within each Region and promote the results of research and development projects among the "user community" both within and outside of EPA. These Regional R&M Representatives are also generally aware of the activities and objectives of the various programs of OR&M and can provide much useful information about its method of operation, organization, points of contact on various subjects, etc.

**/See Appendix B for organizational charts for Headquarters and the four National Environmental Research Centers.

The subject categories or Program Elements into which OR&M's activities fall may be grouped into 13 major Program Areas.

These are:

Health Effects — epidemiological studies, toxicological, teratological research, etc.

Ecological Effects — studies of terrestrial and aquatic ecosystems, both biotic and abiotic, as impacted by pollutants and toxic substances

Transport Processes — meteorological research, pollutant pathways, physical/chemical phenomena, eutrophication, etc.

Measurements and Instrumentation — analytical methods development, trace contaminant detection, instrument development

Pollutant Characterization — documentation of pollution effects, air/water quality standards development

Water Supply — research on drinking water standards, protection of tap water quality, water treatment

Municipal Technology — advanced waste treatment, water renovation, storm and combined sewer overflows

Applied Science and Technology	— industrial, mining and agricultural water pollution control, control of oil and hazardous material spills
Solid Waste Technology	— processing and disposal of municipal, industrial and agricultural solid wastes, source reduction, recycling
Air Pollution Control Technology	— sulfur oxide, nitrogen oxide, particulate control technology
Implementation Research	— cost/benefit implications of alternative environmental protection strategies, environmental management innovations
Environmental Studies	— delineation of anticipated long-term environmental impacts of various activities, environmental forecasting
Monitoring	— measurement standardization and quality control, remote sensing methods, review of Agency monitoring programs

In addition to the above Program Areas, the Office of Research and Monitoring sponsors a Minority Institutions Research Support Program (**MIRS**). This Program provides technical and financial support to minority colleges as well as fulfilling research and monitoring requirements of the Agency. Detailed information on **MIRS** can be obtained from the Director, Minority Institutions Research Support Program, Office of Research and Monitoring, Environmental Protection Agency, Washington,DC 20460.

Office of Research and Monitoring's Grant and Contract Activities***/

As the specific objectives within each Program Element are established, a series of "Tasks" are devised which will lead to attainment of the various planned objectives. Some of these Tasks will be carried out directly by EPA's staff while others are planned for accomplishment by grant or contract. Brief descriptions of each of these grant or contract Tasks are provided in PART II along with the approximate amounts of funds available for carrying out the grant Tasks and the contract Tasks listed within each Program Element. The expected "funding mechanism", i.e., grant or contract, and the "legislative authority" under which the work is planned to be done are also listed. Based upon the authorizing Legislative Code indicated for each task, an applicant can determine from Appendix A what eligibility requirements, cost sharing, funding limitations, etc. will apply.

All planned contracting is carried out competitively with notices of the availability of Request for Proposal (RFP) documents publicly advertised. Unsolicited contract proposals should *not* be submitted for such projects. The review/selection procedures followed may vary slightly from project to project, but all pertinent information regarding both the project objectives and criteria for evaluation of proposals will be included in each RFP package.

Neither PEM's nor PED's should be contacted for information on individual contract Tasks since such communication may conflict with Federal Procurement Regulations and could serve to disqualify a prospective contractor from further consideration.

With regard to all Tasks indicated to be funded by grants, contact with the cognizant PEM or PED is encouraged. In general, the PEM will be better able to respond to questions relative to over-all Program Element objectives, long-range planning, and program interactions within EPA while the PED will have more detailed information on individual Tasks and will, in fact, generally be the individual responsible for making the award/reject recommendation on individual proposals. Another source of information and assistance, particularly for general inquiries, is the OR&M Representative in each EPA Regional Office. These individuals can often give helpful guidance to those who find that their need for information relative to a specific subject is not satisfied by this document.

***/Note: Information on other EPA grant programs is presented in the booklet, "Grant Assistance Programs of the Environmental Protection Agency", available from EPA's Grants Administration Division, Washington, DC 20460. Information on contracting procedures and policies is presented in the booklet, "Contracting with EPA — A Guide for Prospective Contractors", available from EPA's Contracts Management Division, Washington, DC 20460.

Guidelines For Submission Of Grant Applications Or Contract Proposals

A. Solicited contract proposals –

Requests for Proposals (RFP's) for all planned contract Tasks will be advertised in the *Commerce Business Daily*. These advertisements provide instructions for obtaining RFP packages from EPA's Contracts Management Division. Each RFP package includes detailed information on the form and content of proposals to be submitted as well as the required time and place of submission.

B. Unsolicited contract proposals –

While most of OR&M's contract research and demonstration is conducted through use of RFP's to solicit proposals (item A above), contracts can also be awarded on the basis of unsolicited proposals which meet the sole-source requirements of the Federal Procurement Regulations. Unsolicited contract proposals should be addressed to the Grants Administration Division, Environmental Protection Agency, Washington, DC 20460. While no specific format is required, such proposals should generally contain:

1. Project objectives
2. Need, utility and significance of project
3. Scope of work, i.e., project plan
4. Experimental data previously developed or feasibility studies completed
5. Estimated duration of project
6. Scientific or technical references
7. Technical capabilities (personnel, facilities, special resources)
8. Project costs

The material submitted should contain both a *technical* and a *business* proposal. The *technical* proposal should clearly define the unique concept involved and include a plan for turning the concept into reality. It is suggested that the technical proposal identify any proprietary aspects of the proposed ideas or process. The *business* proposal should include a detailed cost proposal, information concerning past Government Contracts, and any special terms and conditions desired.

C. Research or demonstration grant applications –

Preproposals —

Although grant applications may be submitted at any time and on any subject, often it will be helpful to those seeking support to contact EPA first to get more specific details about current R&D objectives and about Tasks recently started or which may have been deferred. Such discussions can often save time and effort, both for the applicant and for EPA, by highlighting subject areas most likely to receive favorable consideration.

Two other actions which can be taken prior to submission of a formal grant application will also be helpful:

1. Review OR&M's current list of grant Tasks to be funded in the specific area of interest (PART II of this document) to determine whether these objectives match the applicant's research interests and capabilities; and

2. Submit a "preproposal" of the proposed research concept to the cognizant PEM/PED for informal review.

   A preproposal should normally consist of a three or four-page narrative outlining the project concept and containing the following information:

   (a) **Objective** – a clear statement of the specific objective is necessary. If the objective is designed to fulfill a specific Task or Tasks (as identified in Step 1 above), they should be identified. If the objective cannot be associated with any specific Task, some statement of the presumed value to EPA of attaining the research objective should be made.

(b) **Project Plan** — a brief description of the research/development/demonstration concept and the plan for execution of the proposed project, including a projected time-schedule for accomplishment of intermediate project milestones and the final objective.

(c) **Budget** — a preliminary estimate of total project costs along with an indication of the share of the project costs which will be provided by the applicant.

(d) **Staff Facilities** — a brief listing of key project staff and capabilities and a brief description of any special facilities which would contribute to the success of the project. A single person who will have responsibility for planning, coordination, and supervising the project should be identified along with the fraction of his time to be devoted to the project.

Following review and evaluation of the preproposal, the prospective applicant will be advised whether (a) an application should be submitted for formal review, (b) submission of a modified preproposal is suggested, or (c) further pursuit of the particular topic is discouraged.

Formal proposals —

All formal grant applications are to be submitted to the Grants Administration Division, Environmental Protection Agency, Washington, DC 20460. After formal "logging in" and acknowledgement, submissions are referred to the Office of Research and Monitoring for program relevance and scientific/ technical merit review. Program relevance reviews are conducted at Headquarters by the Program Element Managers (PEM's) who are the individuals most acquainted with OR&M's objectives, target dates, and resources and who are most aware of inter-Element relationships. Their review quickly screen out those applications for which EPA has no authority or interest or those for which no funds are available. For relevant proposals, scientific/technical merit reviews are then conducted by *both* in-house experts and extramural reviewers. Extramural reviews are obtained in the National Science Foundation fashion — individual written reviews submitted by mail. Comments are also obtained from the Regional Office in the Region where the project would be conducted to determine the relevancy of a proposed project to Regional programs and policies.

The individual coordinating the scientific/technical merit review (normally the cognizant PED) assembles and evaluates both intramural and extramural review comments and prepares a recommendation for action on each application. The recommendation may be to award a grant, to reject the application, or to attempt to modify the scope of work. In those cases where the proposed scope of work could be modified in order to relate more directly to EPA's objectives and thereby qualify for funding, direct contact is made with the applicant to determine whether or not acceptable adjustments in the scope of work can be made.

PART II

LISTING OF GRANT AND CONTRACT TASKS PLANNED FOR FUNDING DURING FISCAL 1973

HEALTH EFFECTS PROGRAM AREA

Health effects research is directed toward assessment of health hazards associated with environmental pollution from a number of media and categories including air, water, pesticides and radiation. Various disciplines are brought together for this purpose. Major program emphasis is devoted to the Community Health and Environmental Surveillance Studies (CHESS) Program. CHESS consists of a series of epidemiologic studies in various communities throughout the United States whose objectives are to evaluate the effects of exposure to common pollutants upon sensitive health indicators.

Complementing CHESS is the Biomedical Research Program which is directed at assessing, at the community level, pollution upon human physiology. Evaluations of health effects resulting from community level environmental pollution and classical and innovative toxicologic research studies are conducted. Scientific information on the health effects associated with exposures to fuels, fuel additives and their combustion products is collected. Pesticides, radiation and specific toxic substances are evaluated in studies conducted within this program area.

The cumulative output from all of these programs will provide needed health intelligence required to formulate environmental policies protective of public health.

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HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1A1005 – COMMUNITY HEALTH EFFECTS SURVEILLANCE STUDIES (CHESS)

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 74,000
Contracts: See RFP when issued.

Program Element Output: Quantification of the health effects of human exposure to air pollutants, and documentation of the health benefits of environmental control. Program effort includes: (1) developing additional, more sensitive health indicators; (2) surveying human populations to detect health effects resulting from pollutant exposure and; (3) expanding the number of pollutants to be studied, including surfur oxides, nitrogen oxides, particulates, photochemical oxidants, trace metals, and synthetic organic toxic substances such as pesticides.

Program Element Manager (PEM):

Dr. Vaun Newill
Health Effects Branch
Environmental Protection Agency
Waterside Mall
Washington, DC 20460
Telephone: (202) 755–0464

Program Element Director (PED):

Dr. Carl M. Shy
Division of Health Effects Research
Environmental Protection Agency
Research Triangle Park, NC 27711
Telephone: (919) 549–8411

PROGRAM ELEMENT NO. 1A1005

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-03	Headquarters monitored grants to investigate newly recognized high priority environmental health problems and/or to provide health intelligence required to support regulatory action.	Research Grant	103	Newill
PEMP-04	Cadmium International Studies.	Contract	103	Newill

HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1A1007 – BIOMEDICAL RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:	
Grants:	$ 125,000
Contracts:	$ 423,000

Program Element Output: Generation of health effects information required for development and revision of criteria and standards pertaining to air pollutants. Program effort includes: (1) studies of pollutants acting singly or in combination with other pollutants or environmental factors; (2) assessment of pollutant effects upon accidental exposure victims, human volunteers, laboratory animals, isolated perfused organ systems and tissue cultures; (3) demonstration of possible adverse effects caused by carbon monoxide, odors, certain trace substances and acid mists; and (4) development of laboratory models to predict the impact of environmental pollution upon biologic systems.

Program Element Manager (PEM):

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Program Element Director (PED):

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Dr. Jerry F. Stara
Environmental Toxicology Research Division
National Environmental Research Center
Environmental Protection Agency
Cincinnati, OH 45268
Telephone: (513) 684–7411

PROGRAM ELEMENT NO. 1A1007

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-07	Short term limit contract with National Academy of Sciences. Required to obtain information related to short term exposures to toxic substances.	Contract	103	Newill
PEMP-08	Headquarters monitored grants to investigate newly recognized high priority environmental health and/or to provide health intelligence required to support regulatory action.	Research Grant	103	Newill

Research Objective Achievement Plan 21AFK: Fuel and Fuel Additive Health Effects Research

Objective: Determine toxicologic effects of fuel and fuel additives emissions in order to provide background health intelligence required for development of emission control strategies. Using appropriate animal species *in vivo* and other bioeffect indicators provide a definitive complete toxicology screen for fuel and fuel emissions and components thereof. Included are gaseous and particulate (trace metal) emissions which result from use of fuels, fuel additives and addition of control devices to the combustion systems. Comparative toxicity is measured using multiple bioeffects criteria based on effects in the various organ systems; they comprise parts of standard test protocol.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFK-21	Highly active binders of metal pollutants.	Research Grant	103	Shy Stara
21AFK-22	Effects of lead and mercury on synaptic transmission in the cat spinal cord.	Research Grant	103	Shy Stara

PROGRAM ELEMENT NO. 1A1007

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFK-23	Electro microscopic studies of selected tissues of animals exposed to fuel additives.	Contract	103	Shy Stara
21AFK-24	Atmospheric filter samples analysis for elemental composition of chemical compound.	Contract	103	Shy Stara
21AFK-25	Blood level analyses for lead using micro methods.	Contract	103	Shy Stara

Research Objective Achievement Plan 21AFT: Trace Metals

Objective: To determine by means of controlled human exposure studies, the effects of specific heavy metals, e.g. lead or manganese, on blood levels, tissue levels and particular metabolic systems. To determine in animals the carcinogenic, mutagenic, or other adverse response to trace material exposure, singly or in combination, and to develop a tissue bank wherein tissues will be stored to provide in subsequent years a rapid flashback capability to demonstrate increasing tissue burdens over time resulting from exposure to trace substances currently in the environment or that might be introduced into the environment.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFT-02	Effect of reduction in leaded gasoline usage on lead tissue burdens in communities — to determine how much lead body burdens decrease as use of lead in gasoline also decreases.	Research Grant	103	Shy Stara

PROGRAM ELEMENT NO. 1A1007

Research Objective Achievement Plan 21AFU: Gaseous Air Pollutants

Objective: Determine by means of human clinical studies or suitable animal models the effects of CO exposure and resulting reductions in oxygen supplies for individual tissues on the brain or cardiac system as indicated by mental or cardiac performance. To determine in animals or isolated tissues the effects of single or combinations of pollutants on respiratory tissues, on pulmonary defense mechanisms and on various blood components. To supplement and verify field observations by means of a mobile laboratory which will permit the delivery and application of controlled laboratory techniques to the field study populations.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFU-03	Development of technique and methods used in the model system for studying pulmonary defense mechanisms.	Contract	103	Shy Stara
21AFU-11	Biological effects of trace substances in interactions with nitrogen oxides.	Contract	103	Shy Stara
21AFU-20	Pulmonary effects of chronic exposure to oxidants.	Contract	103	Shy Stara
21AFU-24	CO effects on auto accidents (CRC).	Contract	103 Stara	Shy
21AFU-34	Effects of CO on myocardial infarction in monkeys (CRC)	Contract	103	Shy Stara
21AFU-38	Investigation of growth of lung function.	Contract	103	Shy Stara

HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1B1019 – WATER QUALITY HEALTH EFFECTS RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 66,000
Contracts: NONE

Program Element Output: Development of valid criteria for setting water quality standards for municipal (drinking) and recreational (freshwater and marine) uses. Research effort includes studies of biological effects resulting from the presence of potentially toxic contaminants in the water environment. The goal of the program is to assure public health and pleasing aesthetics.

Program Element Manager (PEM):

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Health Effects Branch
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Washington, DC 20460
Telephone: (202) 755–0464

Program Element Director (PED):

Mr. Gordon G. Robeck
Water Supply Research Laboratory
National Environmental Research Center
Environmental Protection Agency
Cincinnati, OH 45268
Telephone: (513) 871–1820

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-06	To study effects of recreational water quality upon human health.	Research Grant	5	Newill

HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1D1313 – ENVIRONMENTAL EFFECTS RESEARCH

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Identification of the major effects of storing, collecting, transporting, processing and disposing of solid wastes on man, animals, aquatic life, plants, materials and the environment.

Program Element Manager (PEM):

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Health Effects Branch
Environmental Protection Agency
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Telephone: (202) 755–0464

Program Element Director (PED):

Mr. Robert Stenburg
Solid Waste Research Division
National Environmental Research Center
Environmental Protection Agency
Cincinnati, OH 45268
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HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1E1078 – PESTICIDES HEALTH EFFECTS RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 226,000
Contracts: NONE

Program Element Output: An evaluation of the acute and chronic health hazards from human exposure to pesticides, their residues and their metabolites. This program is concerned with identification of pesticide metabolites; and evaluation of pesticides effects upon normal biological functions. Indices of effects include mortality, growth rate, clinical signs of poisoning, hematologic factors and reproduction. The scope of these investigations ranges from laboratory studies of animals and exposed humans to community epidemiologic projects.

Program Element Manager (PEM):

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Program Element Director (PED):

Dr. Hugh B. Durham
Treatment and Control Research Program
Environmental Protection Agency
9311 Groh Road
Grosse Ile, MI 48138
Telephone: (313) 675–5000

PROGRAM ELEMENT NO. 1F1078

Research Objective Achievement Plan 21AFM: Pesticides Health Effects Research

Objective: Appropriate animal models, with emphasis on non-human primates will be exposed to a variety of pesticides selected according to probability of impact on human health. Various parameters indicative of chronic low-level, acute or sub-acute toxic effects of pesticides will be monitored. Teratogenic, reproductive, neurophysiological, behavioral, biochemical and general pathological effects will be investigated on a dose-response basis. Correlation to field conditions will be made and correlative grants will be initiated, reviewed and evaluated.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFM-42	Relationship of pesticides in soil, water and plants.	Research Grant	301	Durham
21AFM-45	Biological hazards of photo-transformed pesticides.	Research Grant	301	Durham
21AFM-46	Chemistry and mode of action of pesticides.	Research Grant	301	Durham
21AFM-48	Mechanism of Insecticide Degradation.	Research Grant	301	Durham

HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1F1081 – RADIATION EPIDEMIOLOGICAL RESEARCH

Funds: Available as of October 6, 1972 for support of funded Tasks:
Grants: $ 81,000
Contracts: See RFP when issued.

Program Element Output: Qualification by epidemiologic studies of man's risk of developing various diseases due to exposure to radiation. Program efforts will be directed specifically to evaluate: (1) the development of neoplasms of all organ sites of Japanese atomic bomb survivors; (2) the development of thyroid neoplasms in young adults who, as children, received diagnostic doses of ^{131}I; and (3) the development of lung malignancies in patients who have body burdens of thorium dioxide and are continuously exhaling thoron.

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Program Element Director (PED):

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Environnmental Protection Agency
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Telephone: (919) 549–8411

PROGRAM ELEMENT NO. 1F1081

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-04	Implement new initiative in epidemiology to assess energy use limitations.	Research Grant	301	Newill

Research Objective Achievement Plan 21ALY: Radiation by Epidemiological Methods

Objective: Quantitate the risk to man following exposure to ionizing radiation by conducting epidemiologic studies on special population groups that have received known amounts of radiation exposure. Among the risks to be quantitated will be exposure of children to radioiodine, fetuses to gamma radiation from uranium tailings, as well as specific risks associated with acute exposures.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALY-05	Purchase data to develop dose-response curve of thyroid tumors in children exposed to diagnostic levels of radioiodine.	Contract	301	Garner
21ALY-06	Determine feasibility of defining relative tumoriogenic sensitivity of human organs exposed to acute radiation.	Research Grant	301	Garner

HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1F1082 – RADIATION HEALTH EFFECTS

Funds: Available as of October 6, 1972 for support of funded Tasks:
Grants: $ 189,000
Contracts: NONE

Program Element Output: Definition of the health effects in man resulting from exposure to ionizing and electromagnetic radiation in order to provide the scientific base for development of general population guidelines and standards. The program includes experimental laboratory investigations on effects of specific radionuclides, and evaluation of and interactions between ionizing radiation and other biological, chemical and physical environmental pollutants.

Program Element Manager (PEM):

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Program Element Director ((PED):

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Radiological Research
Environmental Protection Agency
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Las Vegas, NV 89114
Telephone: (702) 736–2969

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-10	Implement new initiatives in radiation health effects.	Research Grant	301	Newill

Research Objective Achievement Plan 21AMB: Physiological Behavior of Plutonium

Objective: The chemistry of P_u in soils will be studied in detail, particularly to determine quantitatively the major environmental forms. These various chemical forms along with such well known forms as P_u02 will be used for ingestion and inhalation studies in animals including determining absorption, metabolism, chemical forms in blood and tissues, pattern of distribution, retention, translocation and biological effects for various does levels and age groups.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AMB-04	Study of the spatial distribution of alpha particle dose in bone.	Research Grant	301	Garner Porter Moghissi

Dr. Alan Moghissi
Radiological Research
Environmental Protection Agency
P. O. Box 15027
Las Vegas, NV 89114
Telephone: (702) 736–2969

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-10	Implement new initiatives in radiation health effects.	Research Grant	301	Newill

Research Objective Achievement Plan 21AMB: Physiological Behavior of Plutonium

Objective: The chemistry of P_u in soils will be studied in detail, particularly to determine quantitatively the major environmental forms. These various chemical forms along with such well known forms as P_u02 will be used for ingestion and inhalation studies in animals including determining absorption, metabolism, chemical forms in blood and tissues, pattern of distribution, retention, translocation and biological effects for various does levels and age groups.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AMB-04	Study of the spatial distribution of alpha particle dose in bone.	Research Grant	301	Garner Porter Moghissi

PROGRAM ELEMENT NO. 1F1082

Research Objective Achievement Plan 21AMD: Multiple Co-existing Environmental Stress Studies

Objective: Determine quantitative aspects of co-carcinogenesis by environmental agents and radiation in a thru-put system consisting of cell cultures by developing a tumor virus transformation system and a tumor virus induction system to assess carcinogenic potential. Potentially carcinogenic pollutants which are most likely to interact with radiation damage will be selected. Investigation of the possible interactions which may exist between radiation and other environmental stresses such as heavy metals.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AMD-27	Effect of methyl mercury on the nervous system of irradiated rats.	Research Grant	301	Garner Porter Moghissi
21AMD-39	Study influence of radiation exposure dose rate on life span of mice.	Research Grant	301	Garner Porter Moghissi

Research Objective Achievement Plan 21AME: Biological Effects of Non-Ionizing Radiation

Objective: Determine if there are detectable and significant biological effects from environmental exposure to low levels of electromagnetic radiation. Emphasis is given to studies of possible basic mechanisms of interaction and long term genetic effects using living organisms, cell cultures, and biologically important molecular systems. If such effects are found, the physical parameters of the radiation as well as the biological conditions necessary for the expression of the interaction will be defined.

PROGRAM ELEMENT NO. 1F1082

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AME-05	Study effects of microwave radiation, and of homogeneous and inhomogeneous electrostatic and magnetic fields, on mutation and on chromosome behavior.	Research Grant	301	Garner Porter Moghissi

HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1H1092 – NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Evaluation of the impact of low level chronic exposures of man to environmental pollutants, with particular emphasis upon possible carcinogenic, mutagenic and/or teratogenic effects. Initial effort will involve laboratory animals but with emphasis upon the ability to extrapolate these data to man.

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Program Element Director (PED):

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HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1H1099 – TOXIC SUBSTANCES HEALTH EFFECTS RESEARCH

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Development of specific information to be used as a basis for necessary regulatory action on the potential health effects of new and existing chemical toxicants. The total assessment of health effects due to the multi-media exposure of the public to toxic chemicals requires the development of an extensive information system. A system containing production and distribution information for each chemical and the capability for sorting data on effects and pollutant burdens will be developed under this program element. This information system will be used to identify problems of national scope and will aid in determining health research priorities for these problems.

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Program Element Director (PED):

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HEALTH EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. XF1106 – AEC RADIATION EFFECTS PROGRAM

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Determination, by means of laboratory and field investigations of the potential hazard to humans and the environment resulting from nuclear testing activities. The establishment of testing criteria and radiation protection standards requires an understanding of the behavior of selected radionuclides in man's food chain and the environment. In this study, radionuclide metabolism in beef, dairy animals and plants; soil plant relationships; and the transport, distribution and exchange within and between these components will receive primary consideration.

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ECOLOGICAL EFFECTS PROGRAM AREA

The ecological effects research area is responsible for determining the effects of air and water pollutants on ecosystems and on biotic and abiotic subcomponents of these ecosystems. The objective of the program is to develop scientific information necessary for water quality criteria and secondary air quality criteria.

Programs on aquatic systems are conducted to determine the effects of pollutants such as temperature, pesticides and heavy metals on fresh and marine water fish, invertebrates and their food chain organisms. Acute and chronic effects of pollutants on life stages of the organisms are determined.

Investigations of the effects of major air pollutants on crops and vegetation are conducted to provide information for establishing secondary ambient air quality standards. Specific studies of the effects of NO_x, SO_x, hydrocarbons, and oxidants are conducted on representative terrestrial ecosystems.

Also included are studies of alternative methods of pest control. These efforts are aimed at the reduction of dependence upon persistent chemical pesticides. Non-chemical methods of pest control with great specificity on target organisms and little or no effects on non-target organisms are sought. Acceptable methods of approach may include hitherto unutilized combinations of presently known non-chemical means; new biologically attractive compounds such as insect sex hormones which have great specificity on target organisms; state-of-the-art studies on specific problem areas related to dynamics of pest population control, management or suppression; or other innovative new approaches with a comparatively low-risk factor for success.

ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1A1006 – ECOLOGICAL IMPACT OF AIR POLLUTION

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 192,000
Contracts: NONE

Program Element Output: (1) Determination of the effects of air pollutants on biotic (crops, vegetation, domestic animals, and wildlife) and abiotic (soil, water, major natural and man-made materials) components of the environment; (2) Assessment of the effectiveness of control measures through monitoring of selected ecosystems such as urban oxidant complexes, fossil fuel combustion emission complexes, fluoride emission complexes and hydrocarbon emission complexes; in order to provide a better understanding upon which to base realistic control efforts through the setting of secondary ambient air quality standards and other control measures.

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PROGRAM ELEMENT NO. 1A1006

Research Objective Achievement Plan 21ALS: Impact of Ambient Oxidant Concentrations on Forest Vegetation

Objective: The effect of ambient oxidants on a forest ecosystem will be investigated through an extramural contract by a multi-disciplinary team utilizing coordinated laboratory and field research effort. A mathematical model will be developed to (1) direct and coordinate research, (2) predict the effect of continued, intensified, or reduced oxidant stress, and (3) extrapolate prediction capabilities to other forest systems.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALS-04	Direction and modeling of San Bernardino Forest Ecosystem Study. Application of mathematical modeling techniques to data collected by scientist field teams undertaking program.	Research Grant	103	Raniere
21ALS-05	Response of Pine Stomata to Ozone and SO_2.	Research Grant	103	Raniere

Research Objective Achievement Plan 21ALU: Predictive Modeling of the Impact of Air Pollutants on Terrestrial Ecosystems

Objective: To develop a set of biomathematical models using an integrated research program of modeling, field experimentation and laboratory experiments. These models will be developed by interdisciplinary teams consisting of both biological and mathematical personnel. These models will then be linked to employ a systems approach in predicting pollutant impact upon particular terrestrial ecosystems. In the first phase of this program, models will be developed for the Piedmont of North Carolina. Upon validation, these models will be generalized and tested for there other biome types. The data for this extension will be obtained by two contracts and one inter-ROAP activity (ROAP 21ALS).

PROGRAM ELEMENT NO. 1A1006

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALU-20	Grant to study transfer of trace and/or heavy metals through food chains utilizing microcosm studies.	Research Grant	103	Raniere
21ALU-21	To develop and implement mathematical and statistical techniques required for model development and validation.	Research Grant	103	Raniere
21ALU-22	To develop statistical techniques to study specific aspects of spatial patterns and ecosystems in order to link temporal and spatial model characterizations.	Research Grant	103	Raniere
21ALU-25	To obtain background data and develop mathematical models for biomass and productivity of particular species of natural vegetation under specific environmental stressors.	Research Grant	103	Raniere
21ALU-26	To examine the biotransformation of specific pollutants by natural microbial populations.	Research Grant	103	Raniere

ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1B1020 – AGRICULTURAL USES

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Information required for the establishment of criteria that will provide a sound scientific basis for setting water quality standards for agricultural uses, including irrigation and the watering of livestock and poultry. Program effort will be directed to (1) determine more flexible criteria required to characterize water quality for irrigation use as modified by climate, soil factors, management practices, quality of water, kinds of crops; and (2) determine tolerance limits for herbicides transported in irrigation water from non-cropped areas to cropland. Included will be an examination of the effects and concentration of trace elements.

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Program Element Director (PED):

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ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1B1021 – FRESHWATER FISHES, OTHER FRESHWATER LIFE, AND WILDLIFE

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 185,000
Contracts: $ 255,000

Program Element Output: Valid criteria for setting water quality standards for the propagation of freshwater fishes and other aquatic life and wildlife. Program efforts will be directed to develop criteria for fishes, including anadromous fishes, and invertebrates and their food chain organisms, for such factors and pollutants as temperature and dissolved oxygen, heavy metals, pesticides, and constituents of complex organic effluents. Tolerance levels, safe levels, and long-term exposure effects will be determined.

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PROGRAM ELEMENT NO. 1B1021

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-25	Effects of NTA and micronutrients on stream communities.	Research Grant	5	Allen

Research Objective Achievement Plan 16AAD: Effects of Heavy Metals Upon Freshwater Aquatic Life

Objective: Determine "safe" concentrations of copper, lead, mercury, cadmium, chromium, zinc, nickel, selenium, iron, aluminum and other heavy metals, both singly and in combinations, for freshwater organisms. Bioassays, physiological studies, studies to identify and quantify toxic species of the metals, interaction studies, and field studies provide recommendations for safe concentrations in the aquatic environment.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
16AAD-16	Develop ultra-micro techniques for analyzing trace heavy metals.	Contract	5	Mount

Research Objective Achievement Plan 16AAK: Effect of Selected Hazardous Synthetic Organics in the Freshwater Environment

Objective: Develop water quality criteria to protect freshwater aquatic organisms and man from pesticides and other toxic synthetic organics entering the environment. Through chronic and acute laboratory exposures of representative aquatic organisms, and appropriate tests to demonstrate field applicability, provide information needed to recommend pesticide standards. New as well as insufficiently known older compounds are to be tested.

PROGRAM ELEMENT NO. 1B1021

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
16AAO-05	Select sites to test prototype streams.	Contract	5	Mount

ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1B1022 – MARINE FISHES, OTHER MARINE LIFE

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 127,000
Contracts: $ 477,000

Program Element Output: Valid criteria for setting water quality standards for the propagation of marine and estuarine fishes, invertebrates and their food chain organisms, and wildlife. Specific objectives include (1) determining safe levels of pesticides and pesticide derivatives in estuaries and coastal waters; (2) determining the effects of organic chemicals, heavy metals, petroleum and petroleum by-products on marine life; and (3) determining temperature and dissolved oxygen requirements for marine life. Acute and chronic effects of pollutants on the various life stages of the organisms will also be determined in order to specify safe levels of the pollutant involved.

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PROGRAM ELEMENT NO. 1B1022

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-14	New investigation, exploratory activity, development of new experimental procedures for water quality criteria research.	Contract	5	Allen

Research Objective Achievement Plan 21AKF: Ecological Requirements for the Protection of Estuarine and Marine Life

Objective: To determine optimum, minimum and maximum levels and ranges of dissolved oxygen, temperature, salinity, current, light, turbidity, pH, CO_2 and total alkalinity, singly and in combination, necessary for propagation and maintenance of important marine and estuarine populations. Standard criteria will be developed for experimental animals on any or all of the following bases: (1) physiology, (2) behavior, (3) determination of accumulated levels of trace elements and organics, (4) histology, and (5) documented life histories (through rearing and culture activities). Data will be laboratory verified under simulated field conditions.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKF-05	Culture techniques and environmental requirements through research contracts.	Contract	5	Schneider
21AKF-06	Culture techniques and environmental requirements through research contracts.	Contract	5	Schneider
21AKF-08	Culture techniques and environmental requirements through research contracts. RFP planned for 7/1/72 for Southwest Coast Fish Culture.	Contract	5	Schneider

PROGRAM ELEMENT NO. 1B1022

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKF-09	Culture techniques and environmental requirements through research contracts.	Contract	5	Schneider
21AKF-16	Interface standard laboratory control systems with field sensors, buoys and computer hardware through research contract.	Contract	5	Schneider
21AKF-25	Develop and modify technology necessary for verifying physiological state, histological history and environmental history (through determination of total body burden of inorganic and organic metals) through research grants.	Research Grant	5	Schneider
21AKF-27	Develop and modify technology necessary for verifying physiological state, histological history and environmental history (through determination of total body burden of inorganic and organic trace metals through research grants).	Research Grant	5	Schneider

ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1E1077 – PESTICIDES ECOLOGICAL EFFECTS RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $ 263,000

Program Element Output: (1) Information essential for the pesticide registration and control programs, and (2) Supporting data for the development of water quality criteria for aquatic life. The program includes the effects of toxic organics, including pesticides, the interactive effects of pesticides or combinations of other pollutants such as pesticides and heavy metals and the ecological tolerance levels for pesticides and effects of sublethal concentrations upon aquatic ecosystems. Investigations will be conducted on terrestrial, freshwater, estuarine, and marine flora and fauna.

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PROGRAM ELEMENT NO. 1E1077

Research Objective Achievement Plan 10AKC: Effects of Selected Hazardous Synthetic Organics on the Ecology of the Coastal Environment

Objective: Determine effects of pesticides and other hazardous synthetic organic chemicals in estuaries. Determine the effects on (1) natural ecosystems, (2) simulated ecosystems, and (3) organisms from all trophic levels, including bacteria, algae, plants and animals. Use strict statistical procedures to generate data that will have input into establishment of water quality criteria. Use computer analysis for development of ecological models of pesticide pollution in estuaries. Provide specific recommendations for tolerance limits of toxic organic substances and label registration.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
10AKC-33	Study the effects of selected pesticides on estuarine bacteria including rates of pesticide degradation and metabolites formed.	Contract	301	Duke
10AKC-34	Study the effects of selected pesticides on estuarine algae.	Contract	301	Duke
10AKC-35	Study the effects of selected pesticides on estuarine macrophytes.	Contract	301	Duke
10AKC-36	Study the effects of selected pesticides on estuaries.	Contract	301	Duke

ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1E2080 – ALTERNATIVE METHODS OF PEST CONTROL

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 300,000
Contracts: NONE

Program Element Output: Methods of pest control which will cause significantly less environmental disruption than that caused by currently available pesticides. Research topics include, among others, biological control of pests, genetic manipulations of pest and target organisms, use of pheromones in insect population management, cropping practices in regard to pest ecology, economic aspects of crop losses and means of integrating various methods for effective control. This program is closely coordinated with the National Science Foundation and the U.S. Department of Agriculture.

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Program Element Director (PED):

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PROGRAM ELEMENT NO. 1E2080

Research Objective Achievement Plan 06ALI: Alternative Methods of Pest Control

Objective: Identify six major crop or economic plant systems in which present chemical pesticides are proving increasingly inadequate for pest management and implement a Nationwide multidiscipline inquiry to identify and evaluate alternative options for controls. Initiate inquiry into selected economic aspects of alternative options and procedures. Define effects and potential interactions of alternative pest management methods under urban, suburban and rural practices.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
06ALI-03	Economic impact of alternative pest management options. A crop by crop assessment of the potential impact of new or different pest management techniques, including but not limited to, alfalfa, citrus, cotton pone, and stone fruits, and soybean, which will describe and project the potential economic consequences which might be expected by all related segments of the farm industry, e.g., the farmer, farm industry suppliers and tradesmen, direct consuming public, indirect consuming public, such as feeder operatives, etc.	Research Grant	301	Wiser

PROGRAM ELEMENT NO. 1E2080

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
06ALI-04	Effects of alternative pest management methods under urban, suburban, and/or rural practices. Projection of effects of practices developed for alfalfa, citrus, cotton pone and stone fruits, and soybean crops within society. Search for potential hazards prior to occurence to reduce potential unforseen impact on either target or non-target biota. Study should include rural, suburban, and application of practices wherever feasible.	Research Grant	301	Wiser

ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. 1H1100 – TOXIC SUBSTANCES ECOLOGICAL EFFECTS RESEARCH

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: An evaluation of the ecological impact on ecosystems of the introduction of toxic substances into the environment, including terrestrial and aquatic environments and their interfaces. Specific objectives include: (1) development and evaluation of data on the effects on plants and animals of exposure to toxic substances; (2) determination of the chronic effects on ecosystems of both continuous and brief exposure to toxic substances with other chemicals and/or other parameters. Criteria for these effects include, but are not limited to, species diversity, energy flow, production and degradation of metabolic products.

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ECOLOGICAL EFFECTS PROGRAM AREA

PROGRAM ELEMENT NO. XF1107 – AEC ANIMAL INVESTIGATION PROGRAM

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: An evaluation of the uptake and distribution of radionuclides in tissue and bone samples from domestic and game animals in the environs of nuclear testing. Knowledge of the tissue distribution of radionuclides in the animals, in areas adjacent to nuclear testing sites will provide input into a review of design and testing criteria.

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TRANSPORT PROCESSES PROGRAM AREA

This Program Area is concerned with determining the chemical and physical factors associated with sources, pathways, persistences, and fates of pollutants in the environment. The results of these studies along with results from effects and other research areas provide the scientific and technical basis for control and abatement actions.

The processes governing the movement and interaction of pollutants with the gaseous, liquid, and solid portions of our environment are complex and varied. Specific investigations of these processes conducted by the transport processes program are concerned with:

(1) Determining effects on the environment resulting from use of vehicular fuels and their additives.

(2) Field investigations of regional air pollution to provide a data base for development and testing of air pollution models.

(3) Studies to improve understanding of the chemical and physical nature of important atmospheric and water pollutants.

(4) Research to determine relationships of meteorological factors to air pollutants and the subsequent effects on visibility, weather, climate, and the impact on air, water, and land quality.

(5) Research to determine the significant physical, chemical and biological conditions which prevail in aquatic ecosystems and the ecological mechanisms which operate in surface, ground and marine waters. This includes the development of the capability to predict the response of natural aquatic systems to pollutant stress.

(6) Research to increase the understanding of the eutrophication process and to develop and demonstrate new or improved methods of eutrophic lake restoration.

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1A1002 – FUEL AND FUEL ADDITIVE REGISTRATION

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: See RFP when issued.

Program Element Output: Registration of all fuels and fuel additives. Program efforts will be to: (1) provide standardized test procedures needed for emission characterization; (2) provide an independently derived information base on the types and amounts of metals; non-metal, and organics present in fuels and fuel additives; (3) assess the effects of fuel and related exhaust emissions on human health and public welfare, emission control devices and visibility; (4) determine fuel emission contributions to total atmospheric pollutant loading; and (5) recommend, as warranted, candidates for regulation.

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PROGRAM ELEMENT NO. 1A1002

Research Objective Achievement Plan 26AAE: Development of Information for Fuel or Fuel Additive Control or Prohibition

Objective: Develop the scientific information necessary to recommend candidate fuels and fuel additives for control or prohibition, including considerations of combustion emission products, effects on performance of control devices, atmospheric loading and transformations, health effects, and ecological effects.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAE-18	Develop usage data on designated fuels for combination with registration and combustion effects data to provide emissions data on specific chemical compounds and elements.	Contract	103	Stopinski

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1A1003 – REGIONAL AIR POLLUTION STUDY

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $3,026,000

Program Element Output: Analysis of the transport and dispersion processes over a large geographical region associated with stable and reactive air pollutants emanating from a multitude and variety of sources. Program efforts will be to: (1) obtain an improved understanding of the atmospheric reactions associated with SO_2, NO_x, hydrocarbons, ozone, organic nitrates, and aldehydes; (2) define an optimum meteorological measurements network for a Region; (3) evaluate the representativeness of meteorological measurements required for diffusion modeling and control strategies; and (4) test independently developed air quality and environmental models.

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PROGRAM ELEMENT NO. 1A1003

Research Objective Achievement Plan 26AAI: Regional Air Pollution Study (RAPS)

Objective: The Regional Air Pollution Study (RAPS) will consist of a detailed analysis of the sources and transport of pollution, meteorology and air quality in the St. Louis region plus effects and economic studies. Special field studies involving atmospheric tracers, aircraft, mobile laboratories, and remote sensing techniques will be used, together with an extensive network of air quality and meteorological stations, to provide a detailed measurement program for a 3–4 year period.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAI-10	Design emission inventory and and conduct initial collection and testing in St. Louis.	Contract	103	Stopinski
26AAI-12	RAPS – St. Louis prime contractor service contract including the purchase and installation of monitoring stations.	Contract	103	Stopinski
26AAI-13	St. Louis Facility and network operations by prime contractor under service contract agreement.	Contract	103	Stopinski
26AAI-18	Develop atmospheric dispersion tracers.	Contract	103	Stopinski

Research Objective Achievement Plan 56AAI: Instrument and Analysis Methods Development

Objective: This is in response to the need for Air Quality Characterization under the Regional Air Pollution Study. It will provide instrument development, prototype testing, field operation of two semimobile monitoring stations in the St. Louis area and feasibility studies of new techniques.

PROGRAM ELEMENT NO. 1A1003

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
56AAI-07	Fabricate and evaluate existing mass monitors giving continuous measurements of less than one hour.	Contract	103	Allen
56AAI-11	Develop and evaluate nondispersive infrared analyzer or filter correlation monitor for HNO_3, NO_2, and H_2CO.	Contract	103	Allen
56AAI-14	Develop laser systems to measure pollutants (e.g., O_3, HNO_3) over long paths. Demonstrate feasibility at St. Louis. Extend contract (1975) to furnish additional pollutant capability. by adding a second laser.	Contract	103	Allen
56AAI-24	Fabricate and evaluate instrument for measuring acetylene at 0.1 *ppb.*	Contract	103	Allen

Research Objective Achievement Plan 56AAJ: Regional Air Pollution Study (RAPS) Air Quality Characterization

Objective: This Research Objective Achievement Plan responds to the needs for Air Quality Characterization under the Regional Air Pollution Study (RAPS). Instruments and EPA personnel will be moved to St. Louis in the summer of 1972 to measure the atmospheric contaminants at selected locations. Isotopic ratios in c_2H_2 and CO will be measured. The level and distributions of SO_2, NO, NO_2, hydrocarbons, PAN and ozone will be measured. Photochemical reactivities of the air will be determined under controlled conditions. The pattern of hydrocarbon pollution will be studied by chromatography and infrared spectroscopy. Size spectra of aerosols, their chemical composition and their distribution in time and space will be determined.

PROGRAM ELEMENT NO. 1A1003

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
56AAJ-06	Develop NO_2 actionometer and other techniques for evaluating rate constants.	Contract	103	Allen
56AAJ-09	Coordinate the St. Louis aerosol characterization program.	Contract	103	Allen
56AAJ-15	Smog Chamber Studies and Kinetics sub-model verification.	Contract	103	Allen
56AAJ-20	NO_x-SO_x transformation in plumes.	Contract	103	Allen

Research Objective Achievement Plan 56AAK: Ecological Studies for Regional Air Pollution Study

Objective: To develop an environmental effects monitoring system which will be tested and refined thru a supportive interdisciplinary mechanism established in the Regional Air Pollution Study. Work will be accomplished primarily via extramural contract. The first phase (FY-73) will entail the development of a workable effects monitoring protocol for the urban, rural and natural environment in and around a large city (St. Louis). A compatible environmental monitoring network will be implemented in FY-74 for the duration of the regional study (Phase II).

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
56AAK-01	Development of environmental effects monitoring system.	Contract	103	Allen

PROGRAM ELEMENT NO. 1A1003

Research Objective Achievement Plan 56AAL: Economic Studies for Regional Air Pollution Study (RAPS)

Objective: Further the development of regional air resources management by building on the existing Regional Air Pollution Analysis (RAPS) modeling capability. The new developments will add additional pollutants and mobile sources to the modeling capability. The existing (RAPS) model deals only with stationary sources and only with one pollutant. The initial effort will involve model development to incorporate stationary and mobile source emissions data for the St. Louis RAPS study area. The approach will be essentially a linear programming one which will utilize the output of emissions inventories, meteorological studies and efforts research together with data on various costs of control alternatives. Determine the benefits of air pollution control on human health, vegetation, land use and community.

The establishment of health panels to obtain economic cost (value of premature death, lost days of work, doctor and medical bills, reduced productivity and discomfort resulting from air pollution) and medical effects of air pollution. All of these will tie in directly to the air pollution data and models developed as part of RAPS and all work is to be performed in the St. Louis area.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
56AAL-01	Economic cost model specification emission control cost data base specification, model development, and linear programming algorithm specification.	Contract	103	Allen

PROGRAM ELEMENT NO. 1A1003

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
56AAL-02	Design and test health cost questionnaire for information on prescription medicine, non-prescription medicine, lost days of work, ill days for non-workers, doctor bills and hospital bills.	Contract	103	Allen
56AAL-03	Adapt Community Health Effects Surveillance Studies (CHESS) data system to include economics data.	Contract	103	Allen
56AAL-04	Modify CHESS panel procedures and questionnaires to obtain data on economic costs of health effects due to air pollution. Modify CHESS analysis programs to include analysis of economic data. Survey region to determine geographic location of economically significant receptor populations (people, animals, vegetation and materials). Human populations would also be grouped by race, income and social economic class.	Contract	103	Allen

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1A1008 – FORMATION AND DECAY OF POLLUTANTS

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $ 281,000

Program Element Output: Improved understanding of the chemical and physical formation (and/or decay or removal) of important pollutants in the atmosphere, including the knowledge of the details of how these pollutants react with each other, with the permanent atmospheric gases, with the sunlight, and the hydrosphere and biosphere required for establishing ambient air quality criteria and establishing a stronger foundation on which to base pollution control strategies and specific pollution control decisions. Among other things, this program will assess, by means of laboratory and field studies, the contribution of pollutants, through their atmospheric reactions, to the atmospheric loading of fine particulates.

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PROGRAM ELEMENT NO. 1A1008

Research Objective Achievement Plan 21AKB: Atmospheric Aerosol Dynamics

Objective: Determine the size spectra, growth processes and chemical composition of atmospheric particles by measurements in the field and in the laboratory. Correlate the observations with existing theory. Through calculations and analyses, extend the theory where necessary. Calculate and measure light scattering by particulate pollutants. Study the division between fine and course particles; study gas particle conversions and particle removal processes.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKB-28	Complete fabrication and operate field laboratory.	Contract	103	Altshuller
21AKB-29	Field laboratory: interface instruments to data acquisition system, prepare software, check out total system.	Contract	103	Altshuller

Research Objective Achievement Plan 21AKC: Processes for the Formation and/or Removal of Toxic and Noxious Substances from the Atmosphere

Objective: Trace the transformations within classes of pollutants such as the sulfur compounds, the nitrogen compounds and the organic compounds. Study the interactions among the various compounds both in the gaseous state and in the condensed phase. Study reactivities and reaction paths. Identify the measure reactive intermediates and final oxidation products. Measure real polluted atmospheres at selected locations and study simulated polluted atmospheres under controlled conditions in the laboratory.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKC-03	Transport and transformation processes involving nitrogen compounds in the air.	Contract	103	Altshuller

PROGRAM ELEMENT NO. 1A1008

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKC-10	Measurement of contaminants in the Los Angeles atmosphere for purposes of model development and validation.	Contract	103	Altshuller
21AKC-11	Studies of transport of oxidant beyond an urban center.	Contract	103	Altshuller

Research Objective Achievement Plan 26AAD: Atmospheric Chemical Reactions of Gaseous Pollutants

Objective: Determine photochemical reactions and reaction rates of gaseous atmospheric pollutants through a program of laboratory measurements on simulated atmospheres, laboratory measurements on pure chemical systems, measurements in the field, and calculations related to the measurements. Provide data necessary for further refinement of kinetics models of the reacting atmosphere and for relating the highly oxidized secondary pollutants to the initially emitted gaseous compounds.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAD-25	Evaluation of rate constants for use on Kinetics sub-model of atmospheric transformations.	Contract	103	Altshuller

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1A1009 – METEOROLOGICAL RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: See RFP when issued.

Program Element Output: (1) Evaluation of the environmental quality and meteorological-climatological information needed for abatement and control actions; (2) development of analytical models to estimate the relationship between arbitrary distributions of pollution sources and the resultant air quality; and (3) evaluation of the impact of air pollutants on visibility, weather, and climate, at scales ranging from local to global dimensions.

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PROGRAM ELEMENT NO. 1A1009

Research Objective Achievement Plan 21ADO: Development of Simulation Models for Describing Air Quality Over Urban Regions

Objective: The development, evaluation and application of numerical, physical and empirical environmental simulation models is promoted by this ROAP. While far from perfect, these models serve to provide important additional information regarding the effect on pollutant concentrations of prospective control-strategy decisions or land-use plans.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADO-16	Determination of transfer rates of nutrients and other airborne gaseous and solid materials from the atmosphere to the hydrosphere.	Contract	103	McCormick

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1B1023 – FATE OF POLLUTANTS IN FRESH SURFACE WATERS

Funds: No extramural Tasks remaining which are planned for funding
in current Fiscal Year.

Program Element Output: Scientific basis for predicting and assessing the fate of pollutants (municipal, industrial, agricultural, etc.) which enter fresh surface waters and the potential exposure of human and aquatic life to these pollutants. This program will examine the distribution, the pathways, and the rates of movement, accumulation and degradation of pollutants in fresh surface water systems, including the chemical, physical and biological factors which influence these phenomena. As a result of this effort, mathematical models will be developed which interrelate components and processes of aquatic ecosystems, and data will be provided to support the formulation of rational water quality standards.

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TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1B1024 – FATE OF POLLUTANTS IN GROUND WATERS

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: See RFP when issued.

Program Element Output: Determination and quantification of the fate of pollutants entering and traversing a ground water resource domain. Program effort will be to: (1) determine the national scope and nature of ground water pollution problems; (2) establish scientific criteria for waste disposal site selection; (3) determine the effects of surface pollution on ground water quality; (4) develop water quality monitoring and management methods for ground water environments; and (5) develop sub-surface waste disposal deep well injection, waste treatment lagoons,or solid waste landfills.

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PROGRAM ELEMENT NO. 1B1024

Research Objective Achievement Plan 21AIO: Nationwide Assessment of Ground-Water Pollution Problems

Objective: Determine ground-water quality problems in the various regions of the United States.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AIO-05	Outline ground-water problems in northwestern United States. This will consist of a brief description of the ground-water resources of the area, an in-depth review of the ground water quality, pollution problems and potential sources of pollution, and research needs and priorities recommended to protect and restore ground-water quality.	Contract	5	Keeley

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1B1025 – FATE OF POLLUTANTS IN MARINE WATERS

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 175,000
Contracts: NONE

Program Element Output: Scientific basis for predicting and assessing the fate of pollutants discharged directly or indirectly into marine waters, and development of techniques for marine environmental quality enhancement. This program determines the distribution, the pathways, and the rates of movement, accumulation and degradation of pollutants in oceanic waters. Specific objectives include, but are not limited to: (1) establishing scientific criteria for marine disposal site selection and optimum disposal methods; (2) characterizing the pollutional nature of wastes, sludges and debris discharged in the sea; and (3) developing monitoring methods for waste disposal operations.

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PROGRAM ELEMENT NO. 1B1025

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-04	Literature search and abstracts of Coastal pollution.	Research Grant	5	Joseph
PEMP-05	Special research studies on short lived marine polluting phenomena.	Research Grant	5	Joseph
PEMP-06	Support of research conference, Joint EPA-NAS workshop on Fate and Effects of Oil Pollution.	Research Grant	5	Joseph

Research Objective Achievement Plan 21AIT: Predictive Models for Pollutants in the Ocean Environment

Objective: To develop and test predictive models which quantitatively describe the physical, chemical and ecological interactions of added polluting substances and pathogenic organisms. Such models describe and predict the pollution sources, their routes and rates of movement, the storage points and rates of accumulation, the transformations and their rates, and the ecological interactions which occur in climatologically and geographically distinct regions.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AIT-36	Determine mechanisms of heavy metal accumulation, transformation and biotic concentration through a study of waste materials presently being discharged, augmented by historical records, and the resulting concentrations found in waters, sediments and organisms of the Los Angeles Bight.	Research Grant	5	Baumgartner

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1B1026 – FATE OF POLLUTANTS IN LARGE LAKES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 76,000
Contracts: NONE

Program Element Output: Scientific basis for predicting and assessing the fate of pollutants in large lakes. Program efforts will be directed towards the development of methodology and information for lake water quality enhancement. Pollution problems of concern include: nutrient enrichment and eutrophication, aquatic weed control, bank erosion and sedimentation, dredge spoils disposal, and industrial waste effects. Development and improvement of mathematical models for lake water quality management is an important sub-objective. (This program is applicable to large lake systems such as the Great Lakes, Great Salt Lake, and the Finger Lakes.)

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PROGRAM ELEMENT NO. 1B1026

Research Objective Achievement Plan 21AKP: Predictive Model of Chemical, Physical, and Biological Processes Affecting Pollution of Large Lakes

Objective: The development of predictive models will include chemical, biological and physical sub-models. Initially the majority of the data requirements for formulating general models of large lakes will be from the IFYGL, mainly for Lake Ontario. After completion of the field year, an assessment of modeling will be made, including how best to adopt the Lake Ontario concepts to other large lakes. The complexity of large lake modeling will require that the effort be performed in stages.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKP-23	Assessment of the biological status of Lake Ontario (IFYGL) – Benthos.	Research Grant	5	Jaworski

Research Objective Achievement Plan 21AKR: Scientific Criteria for Oil Discharge into Large Lakes

Objective: Determine the amount and significance of oil discharges to large lakes other than the Great Lakes. Attention will be given to the larger Arctic lakes near the Trans Alaskan pipeline. Determine the ecological impact of oil discharges to large lakes, including the effect of motor-boat discharges.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKR-01	Determine the amount and significance of oil discharges to large lakes other than the Great Lakes.	Research Grant	5	Jaworski

PROGRAM ELEMENT NO. 1B1026

Research Objective Achievement Plan 25ADR: Guidelines for Controlling Nutrients in Large Lakes

Objective: The guidelines for nutrient control will be developed from studies relating to (1) impact of nutrients on water quality, (2) transport mechanisms and (3) factor controlling algal populations. Both laboratory and field studies will be undertaken to determine optimal means of control needs. Data on controllability will be obtained from studies such as IFYGL and the Upper Great Lakes Reference Program.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
25ADR-05	Delineate, by determining the nutrient budgets of the major large lakes studied, the controllability of the various nutrients.	Research Grant	5	Jaworski

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1B1028 – GREAT LAKES RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:

Grants:	$ 735,000
Contracts:	$ 365,000

Program Element Output: Assessment, evaluation, modeling and forecasting of the long term impact of various human activities on the Great Lakes. Program efforts will include research into such areas as: sources of material input; sinks for materials; transport and distribution of materials; and physical, chemical and biological effects that relate to usage. In addition, methodology will be developed to assess the interrelationships between water quality mangement needs and various uses.

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PROGRAM ELEMENT NO. 1B1028

Research Objective Achievement Plan 21AKS: Predictive Models of Chemical, Physical and Biological Processes Affecting Pollution of the Great Lakes

Objective: The development of predictive models will include chemical, biological and physical sub-models. Using model concepts from IFYGL, modeling effort will be initiated on Lake Michigan. Studies relating to other Great Lakes stress conditions such as hazardous materials, viral prevalence and tailings will be conducted. In contrast to 1B1026, which is more basic research oriented, Great Lakes Research will be more applied, focusing on major problem areas.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKS-03	Conduct a detailed assessment of the water quality conditions in the Great Lakes, including eutrophication, hazardous materials, thermal pollution, and sediment.	Research Grant	5	Jaworski
21AKS-04	Develop a general near-shore transport model for conservative and non-conservative water pollutants.	Research Grant	5	Jaworski
21AKS-05	Reduce Lake Michigan circulation data, including incorporation into a general circulation model.	Research Grant	5	Jaworski
21AKS-06	Develop and apply an overall mixed reactor model for order of magnitude concentration procedures in the entire Great Lakes system. Model to include conservative elements, nutrients, and hazardous materials.	Research Grant	5	Jaworski

PROGRAM ELEMENT NO. 1B1028

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKS-07	Determine the biological consequences of pollution control in the Detroit River and develop guidelines for assessing future control needs.	Research Grant	5	Jaworski
21AKS-08	Determine factors affecting viral and bacterial prevalence in the Detroit River.	Research Grant	5	Jaworski

Research Objective Achievement Plan 21AKT: Guidelines for Controlling Nutrients in the Great Lakes

Objective: The approach used in the Great Lakes Nutrient Control Research Program is dedicated to research monitoring of corrective programs in the Great Lakes. The major objectives are to determine the effect of the nutrient control instituted and to delineate future control needs. The basic scientific data on nutrient transport mechanisms, impacts and sources will be supplied by ROAP 25ADR, 1B1026.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKT-03	Conduct phytoplankton algal nutrient bioassay studies on problem areas of the Great Lakes to further define growth requirements.	Contract	5	Jaworski
21AKT-04	Conduct a toxonomy survey of the near-shore algal growths in the Great Lakes to form a baseline before nutrient control program is instituted.	Research Grant	5	Jaworski
21AKT-05	Conduct nutrient growth requirement study of *cladophora* and other near-shore nuisance aquatics.	Contract	5	Jaworski

PROGRAM ELEMENT NO. 1B1028

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKT-06	Conduct detailed biological assessment of Lake Michigan to determine the effectiveness of the nutrient control program.	Contract	5	Jaworski
21AKT-07	Conduct detailed biological assessment of Lake Erie to determine the effectiveness of the nutrient control program.	Research Grant	5	Jaworski
21AKT-08	Conduct detailed biological assessment of Lake Ontario to determine the effectiveness of nutrient control program.	Research Grant	5	Jaworski

Research Objective Achievement Plan 21AKU: Guidelines for Controlling the Ecological Stresses caused by Thermal Pollution of the Great Lakes

Objective: Determine the total extent and impact of thermal discharges to the Great Lakes, mainly Lakes Michigan, Ontario and Erie, through case studies and remote sensing. Determine what specific guidelines will be required to protect the biota of the Great Lakes. The case study approved will be used to determine long term effects and interactions between discharges.

PROGRAM ELEMENT NO. 1B1028

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKU-01	Determine the extent of the coverage of heated water in Lakes Michigan and Ontario with remote sensing. Through the use of multispectral imagery and ground truth water temperatures, the extent of heated water discharges can be determined. The amount of *cladophora* growth can also be monitored.	Research Grant	5	Jaworski
21AKU-06	Conduct a case study of the long-term biological impact of a heat discharge into Lake Michigan.	Contract	5	Jaworski

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1B1031 – EUTROPHICATION AND LAKE RESTORATION

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 200,000
Contracts: See RFP when issued.

Program Element Output: Development of eutrophication controls and restoration procedures for the lakes and ponds of North America. Specific objectives include (1) development of an understanding of the eutrophication process with emphasis on the role of plant nutrients in aquatic systems, nutrient cycling among water, sediments and biota, and nutrient effects on plant growth; (2) development and demonstration of technology to control and reverse eutrophication processes; and (3) development of methods for monitoring eutrophication conditions and for predicting impact of nutrient sources on the eutrophication of natural waters.

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PROGRAM ELEMENT NO. 1B1031

Research Objective Achievement Plan 21AIY: The Determination of the Effectiveness of Lake Restoration Procedures

Objective: Demonstrate and evaluate lake restoration procedures on a large scale. Many existing or newly developed preventive and remedial processes that have proven successful at the laboratory level will be brought to operating level capable of broad practical application. Some of these processes will be advanced waste treatment, dredging, *in situ* phosphorus precipitation, nutrient exclusion, aeration, sediment drying and flushing.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AIY-04	Conduct literature search on lake restoration demonstration. Prepare report summarizing all restoration methods tried and results achieved.	Research Grant	5	Maloney
21AIY-15	Conduct field evaluation to determine the effectiveness of sediment dredging as a lake restoration method.	Research Grant	5	Maloney

Research Objective Achievement Plan 21AIZ: Methods to Inhibit Algae and Aquatic Weed Growth where Nutrients cannot be Controlled

Objective: Extensive literature surveys, laboratory studies and field evaluation will be conducted to develop and evaluate techniques to inhibit the growth of algae and higher aquatic plants. Emphasis will be placed on nutrient inactivation, aeration, biological control, and/or a combination of these.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AIZ-13	Comprehensive study of artificial destratification to determine associated biological changes.	Research Grant	5	Maloney

PROGRAM ELEMENT NO. 1B1031

Research Objective Achievement Plan 21AJA: Predictive Models for the Eutrophication Process

Objective: Develop and test a predictive model or models which quantitatively describe and define the significant ecological (chemical, physical and biological) phenomena which relate to eutrophication in freshwater and estuarine water bodies. Such models would include numerical terms for: (1) cycling of nutrients in ecosystems, including nutrient uptake and release from bottom sediments; (2) relationship of algal species to available nutrients; (3) community level response to specific nutrient increases and decreases; (4) effects of physical and chemical factors such as light, temperature, pH and salinity on growth of individual species; and (5) the metabolic processes involving nutrients and their cycling.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AJA-04	Development of systematic software directed toward Shagawa Lake data analysis. Test software against data to provide preliminary assessments of the validity and completeness of the terms in the model formulation. Prepare statement of data needs and an estimate of confidence levels for the models developed (Data acquired through in-house efforts).	Research Grant	5	Maloney
21AJA-05	Revise, validate and compare selected predictive models of Shagawa Lake as data is obtained after advanced waste treatment facility start-up.	Contract	5	Maloney

TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1B1032 – THERMAL POLLUTION RESEARCH

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Improved scientific basis for predicting and assessing the amount, behavior, and non-organic effects of heat discharged to the aquatic environment. The development of environmental systems for safe management of heated discharges, including siting requirements for heat discharging plants and beneficial environmental uses of otherwise wasted heat, will also be undertaken.

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TRANSPORT PROCESSES PROGRAM AREA

PROGRAM ELEMENT NO. 1F1083 – RADIATION PATHWAYS RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 40,000
Contracts: NONE

Program Element Output: Information on the behavior, movement, and fate of radionuclides in the aquatic, terrestrial and air environments which will be useful for the purpose of assessing the radiation dose to man resulting through these multiple pathways. Laboratory surveys of the pathways by which radionuclides move through the environment of man will provide a basis for setting radiation protection guides and standards, particularly for nuclear power facilities.

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PROGRAM ELEMENT NO. 1F1083

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-04	Develop HTO transport model code for new initiative in assessing energy use limitation from nuclear energy source.	Research Grant	301	Wiser

MEASUREMENTS AND INSTRUMENTATION PROGRAM AREA

The principal objective of research conducted or supported within the Measurements and Instrumentation Program Area is to develop methods and instrumentation for the detection, identification, and quantification of pollutants in all media at the lowest significant concentration. This research is necessary to provide measurements on the causes, extent, effects and control of pollution and to assist in the setting of standards and determining compliance with standards.

Thus, the Measurements and Instrumentation Area is directed towards the development of instrumentation and methods for the detection and quantitative identification of chemical and biological pollutants in air and water, toxic residues in plant and animal tissues and physical pollutants such as heat, radiation and noise in the environment. State-of-the-art reviews, prototype instrumentation development, and pioneering research studies related to the development of new or significantly improved analytical methods or instrumentation are supported.

MEASUREMENTS AND INSTRUMENTATION PROGRAM AREA

PROGRAM ELEMENT NO. 1A1010 – INSTRUMENTATION AND ANALYTICAL METHODS DEVELOPMENT

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $ 902,000

Program Element Output: Measurement methods, both manual and instrumental, required to support Federal, State and local programs for ambient air quality and source emission measurements. Program efforts will be to develop and recommend methods to the standardization program for ultimate adoption and promulgation as EPA approved methods. This program consists of research, development, testing and evaluation activities and covers all needs for measurement methodology of the air pollution control programs including measurement techniques for all classes of pollutants and pollution sources, mobile and stationary.

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PROGRAM ELEMENT NO. 1A1010

Research Objective Achievement Plan 26AAM: Instrumentation and Measurement Methods to Determine Aggregate Opacity, Size Distribution, Velocity, Composition, and Mass Loading of Particulates from Stationary Sources

Objective: The Research Objective Achievement Plan approach and state-of-the-art methods require two approaches to support implementation of new source performance standards and regional implementation plans. One is the manual method for compliance and setting standards. The other is the development of monitoring techniques to measure parameters of emissions and to provide a continuous record of emissions. The research and development programs consist of one or more of the following efforts to achieve a working measurement method or system: establish state-of-the-art; conduct feasibility study of new concepts and evaluate for application to specific particle parameter; develop and evaluate field prototype; evaluate commerically available systems.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAM-37	Develop and test an *in situ* particle mass instrument based on acoustical principles to operate across the stack.	Contract	103	Altshuller
26AAM-38	Develop and test an *in situ* particle mass instrument based on electro-optical principles to operate across the stack.	Contract	103	Altshuller
26AAM-45	Develop, construct and install facilities for the particulate-related components of the source simulator.	Contract	103	Altshuller
26AAM-64	Procure and evaluate field prototype beta gauge.	Contract	103	Altshuller

PROGRAM ELEMENT NO. 1A1010

Research Objective Achievement Plan 26AAN: Instrumentation and Measurements for Hazardous Substances Emitted from Stationary Sources

Objective: Two measurement approaches are required for emissions of hazardous substances. One is the manual extractive method for determining compliance with the standards. The other is the instrumental monitoring technique to measure real time and to maintain a record of emissions. The research and development program consists of one or more of the following efforts to achieve a working measurement method or system: feasibility study of a new concept and its evaluation for a specific pollutant; development of a research prototype and evaluation; development of a field prototype and evaluation; evaluation of commercial systems.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAN-04	Evaluation and development of sampling and detection systems for measuring total mercury (vapor and particle).	Contract	103	Altshuller
26AAN-05	Development of specific hazardous pollutant instruments (HAPs).	Contract	103	Altshuller
26AAN-08	Development of sampling procedures for polynuclear aromatics HC's and PCB.	Contract	103	Altshuller
26AAN-12	Development of a compact economical X-ray fluorescence analyzer for HAPs.	Contract	103	Altshuller

PROGRAM ELEMENT NO. 1A1010

Research Objective Achievement Plan 26AAP: Instrumentation and Measurements for Gaseous Pollutants Emitted from Stationary Sources

Objective: Two measurement approaches may be acquired for new source performance standards (NSPS). One is the manual extractive method for determining compliance with the standards. The other is the instrumental monitoring technique to measure in real time and to maintain a record of emissions. The research and development program consists of one or more of the following efforts to achieve a working measurement method or system; feasibility study of a new concept and its evaluation for a specific pollutant; development of a research prototype and evaluation; development of a field prototype and evaluation; and evaluation of commercial systems.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAP-25	Develop infrared emission computer programs for Bendix spectrometer.	Contract	103	Altshuller
26AAP-26	Modify Dalmo Victor Instrument.	Contract	103	Altshuller
26AAP-30	Develop selective hydrocarbon measurement systems.	Contract	103	Altshuller

PROGRAM ELEMENT NO. 1A1010

Research Objective Achievement Plan 26ACV: Measurement and Instrumentation Methods for Emissions from Mobile Sources

Objective: Recognizing and defining the specific pollutants emitted by mobile sources as a result of the combustion process or other mechanism such as brake and tire wear; instrumentation and measurement technology is developed to provide a basis for vehicle certification, monitoring and compliance (Clean Air Act Section 202–7) and the analysis of other sources and emissions (Section 212, 231, 232).

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26ACV-12	Evaluate effect of filter media on quantity of particulate measure in exhaust containing largely high-volatility particulate components.	Contract	104	Altshuller
26ACV-14	Development of analytical method for polynuclear aromatics.	Contract	104	Altshuller
26ACV-20	Develop particulate sampling method compatible with certification procedures.	Contract	104	Altshuller

PROGRAM ELEMENT NO. 1A1010

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26ACV-31	Development of methodology for characterization of emissions from aircraft sources.	Contract	104	Altshuller
26ACV-33	Development of an advanced prototype direct reading instrument for particulate mass measurement.	Contract	104	Altshuller

Research Objective Achievement Plan 26ACX: New or Improved Instrumentation for the Measurement of Gaseous Pollutants in Ambient Air

Objective: Continue exploitation of highly successful chemiluminescence family of instruments. Explore use of high energy light sources for absorbance, fluorescence and other types of spectroscopic instrumentation, including open path types. Investigate techniques adaptable to multipollutant sensors for simplification and cost reduction. Pursue development of manually performed laboratory methods for gaseous pollutants on an ad hoc basis.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26ACX-06	Develop nitric acid instrument.	Contract	103	Altshuller
26ACX-14	Develop instrumental method for the measurement of toxic and malodorous sulfur compounds.	Contract	103	Altshuller
26ACX-19	Develop collection technique and lab method to measure Se.	Contract	103	Altshuller
26ACX-24	Develop non-methane hydrocarbon analyzer based on catalytic combustion technique.	Contract	103	Altshuller

PROGRAM ELEMENT NO. 1A1010

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26ACX-31	Development of method for carcinogenic vapors — collection and assay.	Contract	103	Altshuller
26ACX-38	Develop, evaluate field calibration system for NO, O_3, NO_2.	Contract	103	Altshuller
26ACX-41	Develop and evaluate solid state detectors sensitive to monochromatic energy.	Contract	103	Altshuller
26ACX-44	Develop and fabricate long path pollutant analyzer utilizing lasers.	Contract	103	Altshuller

Research Objective Achievement Plan 26AEK: New or Improved Methods for the Measurement and Analysis of Ambient Air Particulates

Objective: Apply new technology to replace HiVol method of total particulate mass measurement with methods capable of improved precision and time resolution of one hour or less. Provide methods capable of discriminating particles according to size, with time resolution of two hours or less. Provide rapid analytical capability for determining elemental composition of collected particles. Develop improved laboratory methods for measuring organic materials of high physiologic impact in collected particles.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AEK-27	Field test and evaluate instrumentation to measure visibility.	Contract	103	Altshuller

MEASUREMENTS AND INSTRUMENTATION PROGRAM AREA

PROGRAM ELEMENT NO. 1B1027 – METHODS DEVELOPMENT FOR IDENTIFICATION OF POLLUTANTS

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 254,000
Contracts: $ 250,000

Program Element Output: Physical, chemical and biological methods for detection, identification and measurement of water pollutants. Program efforts will be to: (1) develop sensors and methods that will indicate the presence of pollutants and measure their quantity down to required levels, rapidly and continuously; (2) develop the necessary instrumentation to utilize these sensors and methods to identify, measure and trace pollutants automatically and economically both *in situ* and by remote sensing; (3) develop statistical testing plans to enable rapid screening of water for pollutants with a minimum number of samples; and (4) develop mathematical models that predict the sources of a pollutant from the information obtained in downstream testing.

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PROGRAM ELEMENT NO. 1B1027

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-14	Analytical methodology information center.	Contract	5	Forziati
PEMP-15	Analytical methodology seminars and symposia.	Contract	5	Forziati
PEMP-17	Develop phosphate free detergent.	Contract	5	Forziati
PEMP-18	Special virology study.	Research Grant	5	Forziati

Research Objective Achievement Plan 05AED: Development of Rapid Methods for the Detection and Enumeration of Pathogenic Bacteria in Drinking, Recreation and Other Waters

Objective: Develop new procedures or modify existing methods for the rapid detection and enumeration of pathogens in the environment; determine the sensitivity, selectivity and accuracy of the methods; and evaluate them for application to the various types of natural waters, wastewaters and related environmental materials.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
05AED-06	Development of reversed phage technique.	Research Grant	5	Ballinger Donaldson

PROGRAM ELEMENT NO. 1B1027

Research Objective Achievement Plan 05AEF: Methods for Determining Biological Parameters of all Waters

Objective: Methods for plankton, periphyton, macrophyton, macroinvertebrates, and fish will be developed and evaluated for Agency use through intramural projects and grant and contract work. Measurement and Instrumentation personnel will be assisted in the selection and evaluation of methods by a standing national committee of senior agency biologists.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
05AEF-03	Develop portable solid-state current.	Contract	5	Ballinger Donaldson
05AEF-09	Biomass determination from chlorophyll.	Research Grant	5	Ballinger Donaldson
05AEF-12	Develop water quality requirement profiles of common species for use in evaluating data.	Research Grant	5	Ballinger Donaldson
05AEF-13	Develop methods of processing and evaluating biological data. Develop computer program for storage and retrieval of biological data.	Research Grant	5	Ballinger Donaldson

Research Objective Achievement Plan 07AAT: Evaluation of Indicator Organisms

Objective: Develop improved, more rapid methodology for the detection, identification and enumeration of pollution indicator organisms in various waters and wastewaters and determine their validity under a wide range of environmental and water quality conditions.

PROGRAM ELEMENT NO. 1B1027

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
07AAT-08	Investigation of the detection of bacterial antigens as pollution indicators.	Research Grant	5	Ballinger Donaldson

Research Objective Achievement Plan 07ABL: Identification of Chemical Pollutants in Industrial Wastewaters

Objective: Latest instrumental and chemical techniques will be applied to the identification of organic and inorganic pollutants in industrial wastes before and after state-of-the-art waste treatment technology. Emphasis will be on characterization of pulp and paper wastewaters from producing plants, textiles, petrorefinery, petrochemicals, steel and other chemicals.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
07ABL-07	Identification of pollutants in wastewaters from textile plants using synthetic and combination cotton synthetic fibers before, during and after activated sludge treatment.	Research Grant	5	Ballinger Donaldson

Research Objective Achievement Plan 24AAP: Identification of Oils and their Sources

Objective: Elemental fingerprinting techniques will be developed for residual oils. Molecular spectral approaches will be investigated for typing oils. Instrumental Neutron Activation Analysis (INAA) and Spark Source Mass Spectrometry (SSMS) will be used for elemental fingerprinting.

PROGRAM ELEMENT NO. 1B1027

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
24AAP-04	Develop improved detectors for neutron activation analysis.	Research Grant	5	Ballinger Donaldson

MEASUREMENTS AND INSTRUMENTATION PROGRAM AREA

PROGRAM ELEMENT NO. 1E1079 – PESTICIDES IDENTIFICATION METHODOLOGY

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Multi-residue methods for determining the extent of human and animal exposure to persistent and biodegradable pesticides. The program will provide information on the action mechanisms of pesticides and their metabolic products and will develop the methodology for the isolation, detection, identification, confirmation and quantification of pesticide residues, metabolites and other chemical contaminants. Data developed by this program will support administrative decisions concerning the registration of pesticides.

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PROGRAM ELEMENT NO. 1F1084

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-02	Implement new initiatives in methods and measurements.	Research Grant	301	Forziati

POLLUTANT CHARACTERIZATION PROGRAM AREA

Documentation of the effects of air pollution constituents and recommendation of standards for these pollutants for both ambient air quality and emissions limitations.

PROGRAM ELEMENT NO. 1A1001 – POLLUTANT CHARACTERIZATION

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $ 425,000

Program Element Output: Documentation of the effects of air pollution constituents and recommendation of standards for these pollutants for both ambient air quality and emissions limitations. Program efforts will be to: (1) revise criteria documents and recommend revised ambient air quality standards for fine particulates, sulfur dioxide, nitrogen dioxide, carbon momoxide, photochemical oxidants, hydrocarbons and others; and (2) recommend control approaches for various pollutants including, among others, manganese, nickel, chromium, vanadium and polycyclic organic materials. In addition, this program will support the setting of National performance or emission standards for a variety of specified sources, such as aircraft, motor vehicles, industrial categories and sources of hazardous pollutants.

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PROGRAM ELEMENT NO. 1A1001

Research Objective Achievement Plan 26AAA: Air Quality Criteria

Objective: Develop the scientific information required (1) to evaluate the need for control of pollutants, (2) to define the control approach best suited for each established control need and (3) to clearly establish air quality criteria for air quality and emission standards.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAA-18	Revise criteria document for particulate matter with emphasis on fine particulates.	Contract	103	Stopinski
26AAA-20	Prepare documentation on Copper necessary for: (1) determination of need for control (2) applicable section of law, if control needed and (3) supporting documentation to accompany rule making.	Contract	103	Stopinski
26AAA-22	Prepare documentation on Zinc necessary for: (1) determination of need for control (2) applicable section of law, if control needed and (3) supporting documentation to accompany rule making.	Contract	103	Stopinski
26AAA-24	Prepare documentation on Chlorine (including HCl) necessary for: (1) determination of need for control (2) applicable section of law, if control needed and (3) supporting documentation to accompany rule making.	Contract	103	Stopinski

PROGRAM ELEMENT NO. 1A1001

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAA-26	Prepare documentation on Selenium necessary for: (1) determination of need for control, (2) applicable section of law, if control needed and (3) supporting documentation to accompany rule making.	Contract	103	Stopinski

WATER SUPPLY PROGRAM AREA

The Water Supply Program Area is directed at establishing health criteria for organic, inorganic and microbiological contaminants of drinking water and criteria to establish and support safe recreational water quality standards.

Techniques to protect water supplies at the source and in the distribution system are developed as well as treatment processes for the removal of contaminants. Specific program investigations are concerned with isolating organic compounds through different separation mechanisms including reverse osmosis, osmotic filter techniques and ion exchange resins; identifying organics by mass spectrometry, gas chromatography, and other methods; and assaying the toxicity of concentrates and partitions.

WATER SUPPLY PROGRAM AREA

PROGRAM ELEMENT NO. 1C1046 – WATER SUPPLY HEALTH EFFECTS RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 100,000
Contracts: NONE

Program Element Output: Development of valid criteria for promulgating water quality standards for municipal (drinking) and recreational (freshwater and marine) uses. Research effort includes studies of biological effects resulting from the presence of infectious agents and potentially toxic contaminants in the water environment. The goal of the program is to assure public health and pleasing aesthetics.

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PROGRAM ELEMENT NO. 1C1046

Research Objective Achievement Plan 21APW: Screening of Known Chemicals for Specific Toxic Effects

Objective: Develop and apply suitable methods for screening the effects of environmental chemicals on various biologic systems. The systems are used to establish effect parameters that can be correlated with biochemical indicators in more accessible tissues. Determine the magnitude of exposure to environmental chemicals by assaying drinking water and human hair.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APW-19	Study of the mutagenic potential of raw vs finished water using cultured mammalian cells and *in vivo* techniques.	Research Grant	103	Robeck

Research Objective Achievement Plan 21APZ: Criteria for Recreational Waters

Objective: Epidemiologic-microbiologic studies will be conducted in recreational waters subject to levels of sanitary, nutrient and thermal pollution so as to quantitatively relate health effects to some measure of pollution. Bacterial or chemical indicators of fecal contamination will be quantified relative to health effects in at-risk population as determined by questionnaire and medical diagnosis. Pathogens capable of health effects and multiplication in nutrient polluted waters also will be quantified. Studies will be preceded by method adaptation to identify and quantify significant health effects and health effectors/indicators.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APZ-05	Develop Illness Inquiry System as a means of obtaining accurate and unbiased data on the health effects of recreational water use. Evaluate system during Phase I of Epidemiological-Microbiological Study. Provide demographic input for site selection.	Research Grant	103	Robeck

WATER SUPPLY PROGRAM AREA

PROGRAM ELEMENT NO. 1C2047 – WATER SUPPLY CONTROL TECHNOLOGY

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: See RFP when issued.

Program Element Output: New or improved technology for the effective and economical control of drinking water contaminants during storage, treatment, and distribution. Program efforts will be directed to demonstrate technologies for removal of infectious agents, potentially toxic or aesthetically displeasing contaminants so that municipal sectors will be able to achieve compliance with present and future water quality standards. Improved methods of operating both new and existing water supply facilities will be developed and demonstrated.

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PROGRAM ELEMENT NO. 1C2047

Research Objective Achievement Plan 21AQB: Evaluation and Improvement of Treatment Processes for the Removal of Trace Organics and Tastes and Odors

Objective: The approach to this problem is two-fold; (1) further field study is needed to evaluate the performance of activated carbon for organic removal; and (2) bench and pilot scale studies on alternate adsorbants and oxidants, such as ozone.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQB-03	Determine general organic content of a variety of finished drinking waters.	Contract	103	Robeck

MUNICIPAL TECHNOLOGY PROGRAM AREA

The Municipal Technology Program Area covers the research, development and demonstration of new or improved technology applicable to the control and treatment of wastewaters generated in and discharged from the urban environment. Pertinent technical areas include unit processes and systems applicable to treatment of municipal sewage to effect the removal of organic materials and other pollutants; control and treatment of wastewaters discharged from sewer systems carrying both storm water and sewage (combined sewers) and urban storm water discharges. The entire urban drainage system is, therefore, included in the Municipal Technology Program.

Beyond the basic development and demonstration of processes and systems, efforts are also directed to process control and instrumentation, computerized systems for process simulation and evaluation and non-pollutional disposal and/or utilization of sludges and concentrated pollutants resulting from treatment.

Several specialized areas of emphasis are included in the Municipal Technology Area. The treatment of municipal wastewaters in cold climates (sub-arctic and arctic areas) is one of these. A unique portion of this cold climate research and development is directed to the provision of effective water supply, wastewater treatment and general sanitation facilities for native Alaskan villages.

The treatment and utilization of both liquid and solid fractions of wastewater by application to the soil is a separately identified technical area, as is the improvement of existing and development of new treatment and disposal methods applicable for individual home use.

MUNICIPAL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2033 – MUNICIPAL SEWERED DISCHARGES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $1,144,000
Contracts: NONE

Program Element Output: New or improved technology for the effective and economical control of pollution from municipal sewered discharges. Program efforts will be directed to demonstrate technologies for nutrient removal, removal of organic materials and other pollutants so that municipal sectors will be able to achieve compliance with present and future water quality standards. Improved methods of operating both new and existing treatment plants will be developed and demonstrated. This effort will include major pilot plant work devoted to developing advanced treatment systems as well as full scale demonstration projects.

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PROGRAM ELEMENT NO. 1B2033

Research Objective Achievement Plan 21AAA: Demonstration of Advanced Technology to Achieve Non-Polluting Municipal Discharge

Objective: Surveys will be conducted to determine discharge quality standards now or likely in the future. Treatment trains will be set up to achieve these standards, up to and including potable requirements in several parts of the country. The combination of unit processes selected will depend on the standards to be achieved and will include an approach to "no pollutant discharge". Candidate processes include conventional biological treatment (air or oxygen), etc. An extensive survey will be conducted to determine advantages (both technical and socio-economic) of land spreading as an effluent treatment. If appropriate, land spreading will be demonstrated in several areas of the country. A survey of package plants available for treating flows up to 0.5 *mgd* will be made. Several package plants will be demonstrated. Materials of construction and safety will be important considerations in all projects.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAA-19	Evaluate and demonstrate irrigation with wastewater.	Demo Grant	6a2	Convery
21AAA-30	Develop new process trains for small and intermittent flows. (Joint EPA-HUD project)	Demo Grant	6a1	Convery
21AAA-36	Demonstrate flow equalization.	Demo Grant	6a1	Convery

MUNICIPAL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2034 – COMBINED SEWER OVERFLOWS AND STORM WATER DISCHARGES

Funds: Available as of October 6, 1972 for support of listed Tasks:

Grants:	\$ 890,000
Contracts:	\$ 980,000

Program Element Output: New or improved methods of abating pollution caused by (1) discharge of untreated or inadequately treated waters from sewers which carry either storm water or both storm water and sewage, and (2) urban run-off not collected and carried in sewers to a point discharge. Program efforts will be to characterize the quality and pollution impact of these wastewaters and to develop methods (processes, hardware and techniques) for their control and treatment. Emphasis will be placed on advanced technology for full-scale plant systems.

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PROGRAM ELEMENT NO. 1B2034

Research Objective Achievement Plan 21AAF: Storm and Combined Sewer Flow Control

Objective: Pollution emanating from stormwater discharges and combined sewer overflows exceeds that of secondary sanitary effluent and in some cases equals raw sanitary sewage. Existing treatment/collection systems cannot cope with peak rates and volumes delivered during wet weather. As a result, prodigious volumes of Combined Sewage (CS)and Stormwater (SW) are discharged untreated to surrounding watercourses. To abate this source of pollution it is proposed to develop and demonstrate measures for effective control of rate, volume and pollution potential of wet-weather inflows to sewer collection systems and for dispatching and for controlling storm and combined sewer flows within the system by investigating the reliability performance, design data and economics of: storage, flow regulation and routing; improved sewer construction methods and materials; increased effectiveness of existing systems; infiltration and runoff volume reduction; combined treat/control for wet weather flow and dual wet and dry weather flow to meet water quality standards and to effect beneficial use of storm and combined sewer overflow.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAF-CU	Develop and demonstrate upstream retention, solids, liquid separation and real-time control with event prediction based on rainfall/runoff history. Conduct hydraulic model studies for upstream sub-surface retention and for optimum design of helical regulator. Prototype comparative evaluation of helic, "SWIRL" (vortex) and stilling ponds flow regulator/ solids-liquid separator. This concept also will alleviate downstream sewerage system overloading.	Demo Grant	6a1	Lederman
21AAF-38	Demonstrate and evaluate impregnation of concrete pipe and and other methods of infiltration control.	Demo Grant	6a1	Lederman

PROGRAM ELEMENT NO. 1B2034

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAF-68	Develop and evaluate methods for determining cumulative runoff volumes with respect to individual and successive storms.	Contract	6a1	Lederman

Research Objective Achievement Plan 21AAG: Application of Simulation Models to Storm and Combined Sewer Overflow

Objective: The capability to analyze component flows throughout the catchment and sewerage system is necessary for better design of wet-weather control/treatment. Past analyses have been inadequate due to complexities of the rainfall/runoff phenomena. Develop, verify, refine and apply computer based mathematical models to simulate urban runoff and combined sewer overflow phenomena and their impacts on the environment as a tool for engineers, planners and local municipal governments, to assess abatement alteration and their economic impact and as a means for evaluating and setting water qualities and effluent standards. Models will be used to analyze complex rainfall/runoff relationships in catchment and sewer systems; to select and design optimal control/treatment approaches based on cost/effectiveness; and to provide capability for implementing real-time or "feed-forward" computerized control. Models will be investigated and simplified to alleviate data input requirements while maintaining or increasing output reliability. Models will be demonstrated, verified and continually updated for various urban areas. Models will also incorporate stochastic methods for rainfall prediction based on varying amounts of local data to augment planning.

PROGRAM ELEMENT NO. 1B2034

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAG-20	Develop "Monitoring/Management System" for use/updating dissemination of Storm Water Management Model (SWMM) and related models. Specifically, this task will provide continued promotion of SWMM usuage; further demonstration and evaluation; adaptation and tailoring of the model to meet the requirements of individual situations; user's assistance and training; a viable economic system for model transference; and basic methodology for an ongoing, effective implementation program of nationwide applicability.	Contract	6a1	Lederman
21AAG-21	Rewrite Storm Water Management Model (SWMM) User's Manual to provide a clear, concise document outlining, in complete logical sequence, the analysis required, data inputs and operating instructions for model use. This effort will include minor updates to SWMM.	Contract	6a1	Lederman
21AAG-22	Refine and verify Storm Water Management Model (SWMM) to include capability to handle surcharge conditions, submerged outfalls in tidal estuaries and interconnections.	Contract	6a1	Lederman

PROGRAM ELEMENT NO. 1B2034

Research Objective Achievement Plan 21AAH: Treatment of Combined Sewer Overflows

Objective: Combined sewer collection/treatment systems are incapable of handling shock loadings caused by storm generated flow. To avoid conventional treatment plant upset, such peak flows are bypassed into water courses untreated. These combined sewer overflows (CSO's) contain a high pollution potential. It is thus necessary to develop/demonstrae/evaluate and apply new physical/chemical/biological combinations of unit processes and to adapt and upgrade existing processes to establish integrated, automated, effective and economic systems for treating CSO and for dual use to polish/treat dry weather effluent to meet water quality standards as well as to effect reclamation/reuse for aesthetic, recreational, irrigational, potable/subpotable purposes. Joint use of complementary treatment/control techniques must be evaluated and the various treatment/control alternatives optimized on the basis of cost/benefit/effectiveness relationships. Integral aspects are provisions for treating and handling sludges produced during treatment/and regeneration/reuse of treatment chemicals. Basic data on CSO characteristics must be compiled for the promulgation of designated parameters, effluent criteria of water quality standards. Instrumentation for sampling, monitoring and automated control must be developed.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAH-CP	Develop and refine multiple use concept for combined/sewer overflow treatment/control systems to include means for optimization of municipal sewage treatment (polishing, tertiary treatment), handling dry weather overloads, maintaining greater environmental control by accepting industrial waste, treatment of liquid waste from municipal air pollution control systems, etc.	Demo Grant	6a1	Lederman

PROGRAM ELEMENT NO. 1B2034

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAH-09	Development of a program for effective pre and post construction evaluation of treatment and control processes. The shock loadings and variations of pollutant loadings with time in combined sewer overflows require field procedures, sampling techniques and methods which differ from those used for dry weather flow.	Contract	6a1	Lederman
21AAH-59	Develop, demonstrate and evaluate, under both wet and dry weather conditions, the "SWIRL" (vortex) device for primary sedimentation, sludge thickening and grit removal and universalize the formulation of device dimensions for each application.	Contract	6a1	Lederman
21AAH-80	Demonstrate and evaluate at full or large pilot plant scale several control/treatment processes and methods which have been developed or are now being developed at small scale. This project is to be coordinated with the two ongoing state-of-the-art and assessment projects on combined sewer overflow management and treatment.	Contract	6a1	Lederman

PROGRAM ELEMENT NO. 1B2034

Research Objective Achievement Plan 21AAI: Treatment of Storm Water Discharges

Objective: The environmental impacts of storm water discharges (SWD) are severe. Air pollution fallout, trash, garbage, pesticides, animal excretas, etc., are routine in SWD and eventually are carried into surface waters uncontrolled. A documented study has shown BOD from surface wash during storms, in a residential area, to approximate secondary treated sanitary effluent and COD was established to exceed raw sanitary sewage from a comparable area. Through state-of-the-art literature searches and assessments, lab studies, pilot and full scale prototype development, demonstration and formulation of means and methods to provide the capability to adequately treat separate SWD's during and following storm events, will be accomplished. Reclamation, regeneration, and reuse of spent processes, chemicals and the treated SW for esthetic, recreational, sub-potable and potable purposes shall be a primary demonstration goal with various aspects associated with the handling, treatment and ultimate disposal of sludges and solids and solid residues of the treatment processes. Develop and demonstrate automatic systems and unit process, integrated with vast urban intelligence systems for entire sewerage network-fundamental tools for this are various quality/quantity *in situ* rapid sensors and mathematical models to also offer datamation for study, plan, design, operation and enforcement purposes.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAI-20	Demonstrate "flow-thru" storm water treatment, i.e., economical means of treating variable storm water flow rates and resultant sludge deposits.	Demo Grant	6a1	Lederman
21AAI-34	Provide a broad scale assessment of management, control and treatment of storm water discharges. This work includes evaluation of various control and treatment methods, the results of their use or lack of use, coupled with design performance and cost information. The assessment is to provide information on a national basis.	Contract	6a1	Lederman

PROGRAM ELEMENT NO. 1B2034

Research Objective Achievement Plan 21AAJ: Technology for Control of Pollution Caused by Urban Non-Sewered Runoff

Objective: Urban non-sewered runoff is a major source of sediment, sediment transported pollutants such as, pesticides, animal excrement, air pollution, fallout, heavy metals, fertilizers (nutrients) and deicing chemicals from highways. This sediment and the resultant erosion problems constitute an essential part of the total urban drainage pollution problem. Through state-of-the-art literature searches and assessments, lab studies, pilot and full scale prototype development and demonstration, formulation of means of methods to provide the capability to adequately control/treat the large percentage of the urban/suburban portion of the total of over 4-billion cubic yards, of sediment pollution annually moving into the nation's rivers, lakes, estuaries, reservoirs and streams. Establishing control over urban and suburban sedimentation pollution will require a multi-agency involvement and a spirit of cooperation so that proper ordinances can be established and enforced.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AAJ-51	Demonstrate at full scale various methods to control and treat urban runoff. While this project would emphasize means to attenuate and reduce non-sewered runoff, the results would contribute to alleviating combined sewer overflows and storm water discharges. Methods would include surface retention, use of porous pavement and cleaning to reduce pollution and contain storm water.	Demo Grant	6a1	Lederman
21AAJ-55	Develop and demonstrate alternative materials/methods for highway deicing, e.g., substitute chemicals, spreading apparatus, spreading rates, etc.	Demo Grant	6a1	Lederman

MUNICIPAL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2035 – NON-SEWERED DOMESTIC WASTES

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Demonstration of technology for the effective and economical control of pollution from non-sewered wastes so that municipal and rural sectors lacking conventional gravity collection systems will be able to upgrade their treatment capabilities to achieve compliance with present and future water quality standards. Program efforts will be to: (1) demonstrate flow reduction devices for the individual home; (2) develop and demonstrate improved home treatment systems; (3) examine economically feasible alternatives to existing septic tank systems; and (4) demonstrate intermediate systems between conventional sewers and individual systems.

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MUNICIPAL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2043 – TREATMENT PROCESS DEVELOPMENT AND OPTIMIZATION

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 50,000
Contracts: NONE

Program Element Output: Process information for use in design of municipal and municipal-industrial wastewater treatment plants. Program efforts will be directed to: (1) develop new or improved technology for removal of pollutants; (2) develop charts and computer systems to facilitate design simulation and evaluation of individual treatment processes and systems of processes; (3) develop process control and instrumentation technology; and (4) develop new or improved methods for non-pollutional disposal of sludges and concentrated pollutants resulting from treatment processes. Operating and economic data from pilot and laboratory investigations will contribute to designs for demonstration facilities. The goal is total water reuse.

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PROGRAM ELEMENT NO. 1B2043

Research Objective Achievement Plan 21ACU: Wastewater System Instrumentation and Automation

Objective: Determine key variables for monitoring and control of sewerage systems and treatment plants. Evaluate instruments, control devices and control strategies by mathematical modeling, laboratory work or field study. Determine and demonstrate optimum control strategies through the use of cost effectiveness, performance and/or reliability.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ACU-40	Demonstrate data acquisition for management and control of reclamation facilities. Establish system design guidelines which would specify the minimum size and quality of digital computer required for data acquisition of municipal waste treatment systems. Guidelines should include alternative approaches, economics, operator training, required manpower and skills and computer maintenance.	Demo Grant	6a2	Convery

MUNICIPAL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2044 – COLD CLIMATE WASTE TREATMENT

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Cold climate waste treatment systems. Program effort will be to develop processes and systems which will provide any level of treatment, up to and including complete treatment. Criteria for treatment processes development will be established by investigating the tolerances of Arctic aquatic species to various concentrations and forms of man-induced pollution.

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MUNICIPAL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2045 – WATER QUALITY CONTROL

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 270,000
Contracts: NONE

Program Element Output: Technological approaches and techniques for pollution control other than conventional or advanced waste treatment of effluent streams. Program effort will be directed to develop new pollution control technology to: (1) control pollution at the source by process and product modification; (2) minimize or reduce pollutional effects through modification of environmental conditions; (3) minimize pollutional effects by managing waste discharges and/or their receiving waters, and (4) utilize soils for the treatment of liquid wastes and sludges. Emphasis will be placed on systems analysis and mathematical modeling, followed by demonstration.

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PROGRAM ELEMENT NO. 1B2045

Research Objective Achievement Plan 21ABY: Development and Demonstration of Soil Systems for Waste Treatment

Objective: Identify infiltration-percolation (IP), irrigation (IR) and spray-runoff (SR), as different techniques needing technology development and demonstration. Evaluate currently available technology to formulate preliminary design models for each approach. Implement in-house, grant and contract studies to provide the data necessary to fully develop dependable design models by the desired completion date of June 30, 1978.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ABY-18	Demo grant infiltration percolation.	Demo Grant	5	Harlin
21ABY-20	Demonstrate infiltration/ percolation, spray runoff or irrigation techniques for applying waste water to land in Northeast United States.	Demo Grant	5	Harlin

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

The objectives within the Applied Science and Technology Program Area are to develop and implement full-scale demonstrations and field evaluations of new or improved waste treatment or economical control processes and measures resulting from new knowledge developed through EPA and/or external research efforts on:

(1) Agricultural activities including: forestry and logging operations; agricultural runoff; irrigation return flows; confined animal feeding; aquaculture and disposal of nonagricultural sludges on crop land. The development and demonstration mode will emphasize concepts which either maximize the potential for recycle or reuse (animal wastes, irrigation systems) or minimize adverse impact for "once through" systems (e.g., pesticide runoff). New and improved management concepts, fertilizer and pesticide formulations and application methods, and structural and equipment changes will be evaluated.

(2) Oil and hazardous material spills prevention, control and clean-up; the objective is to develop an array of countermeasures to contain spills, to prevent them from entering watercourses, and to control and remove those that reach waters to minimize damage to resources and to the water ecosystem. The variability of hazardous materials necessitates development of a wide range of countermeasures. Improved processes need to be developed to convert waste automobile oils to usable products to prevent dumping in watercourses. In addition, adequate methods must be developed to treat and control the discharge of wastes from the operation of vessels and recreational sources.

(3) Industrial manufacturing pollution abatement methods: program efforts will be directed toward demonstrating the best practicable, best available and zero pollution control technology with emphasis on water reuse and product-by-product recovery. The industries of concern are the manufacturing industries as defined by the SIC (Standard Industrial Classification) Major Group 19–39.

(4) Control of water pollution from mining operations and abandoned mining sites; the objective is to allow mining to be carried on in the future without causing environmental degradation.

(5) Control of water pollution from hydrological modifications such as construction, dredging, landfill and water resources development: these activities have the common environmental impact of causing substantial changes in the local or area hydrologic patterns.

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2036 – HEAVY INDUSTRIAL SOURCES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 933,000
Contracts: None

Program Element Output: New or improved methods for the abatement of water pollution caused by the discharge of wastes from heavy industries. These industries include, but are not limited to, metal and metal products, chemicals and allied products, nuclear and fossil fuel power production, petroleum and coal products, machinery and transportation equipment manufacturing, textile mill products, and rubber and plastic products, in addition to any joint industrial/municipal waste sources. Program effort will be directed to achieve, at minimum cost, the equivalent of 85 and 99% removal of contaminants and the technology to achieve closed-loop systems for water reuse. Emphasis will be placed on advanced technology full-scale plant systems.

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PROGRAM ELEMENT NO. 1B2036

Research Objective Achievement Plan 10BAL: Beneficial and/or Multiple Use of Industrial Water Involving Cooling

Objective: Perform research and support demonstration projects to show technical and economic feasibility of additional uses for water which has or will be used for cooling purposes. Primary current involvement is support of Eugene Water and Electric Board grant for demonstrating waste heat use in agriculture. Other research areas include: (1) use of cooling tower exhaust in greenhouses; (2) use of waste heat to prevent icing of shipping lanes; (3) complete recycle of liquid streams in power plants; and (4) use of new makeup water sources.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
10BAL-05	Support demonstration project showing results of pollution impact of water pollution control technology on air pollution and solid waste and land use within steam generation power plants.	Demo Grant	6b	Lederman Rainwater

Research Objective Achievement Plan 21ADT: Develop Technology to Achieve Recycle, Rinse and Closed-Loop Capability for Carbon and Alloy Steel

Objective: Determine problems of waste water recycle, multiple use, and reuse recycle systems for process use, cooling water and power production use. Demonstrate waste treatment possible through water and product recycle or regeneration.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADT-02	Full scale demonstration of closed loop regeneration of spent pickle liquor.	Demo Grant	6b	Lederman Rainwater
21ADT-03	Full scale demonstration of closed-loop tin line rinse system.	Demo Grant	6b	Lederman Rainwater

PROGRAM ELEMENT NO. 1B2036

Research Objective Achievement Plan 21ADX: Develop Advanced Waste Treatment Technology for the Non-Ferrous Metals Industry

Objective: The development and demonstration of advanced waste treatment technology to provide more effective, economical and/or compact systems for abating pollution in the non-ferrous metals industry.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADX-02	Investigation of the cementation method for the removal and/or recovery of metals from wastewater effluents from smelters, refineries, and/or metal fabrication plants.	Demo Grant	6b	Lederman Rainwater
21ADX-03	Experimental crystallization of filterable iron oxide/hydroxide precipitates from acidic leach liquors.	Research Grant	5	Lederman Rainwater
21ADX-04	Demonstration of the regeneration of spent phosphoric acid solutions from the bright finishing of aluminum.	Demo Grant	6b	Lederman Rainwater

Research Objective Achievement Plan 21AEC: Develop Advanced Waste Treatment Technology for the Textile Industry

Objective: Implement several full scale demonstration projects for each major industrial source which provides good engineering and economic analysis of the demonstrated treatment or control system. More than one demonstration project will provide alternate treatment technology for best practicable and advanced/best available waste treatment implementation.

PROGRAM ELEMENT NO. 1B2036

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AEC-02	Pilot or full-scale demonstration project of a physical/chemical system for effluent polishing of synthetic/cotton dyeing/finishing operation with emphasis on partial water recycle.	Demo Grant	6b	Lederman

Research Objective Achievement Plan 21AEW: Develop Advanced Waste Treatment Technology for the Miscellaneous Chemicals Manufacturing and Formulating Industries

Objective: Develop and demonstrate advanced treatment technology to provide more effective and economical removal of contaminants in wastes discharged by the Miscellaneous Chemical Manufacturing Industries covered by SIC Codes 2815, 2816, 283, 284, 2851, 286 and 289.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AEW-07	Develop and demonstrate Advanced Waste Treatment of Gum and Wood Chemicals Wastewaters by Carbon adsorption.	Demo Grant	6b	Lederman Rainwater

Research Objective Achievement Plan 21AHN: Develop Advanced Waste Treatment Technology for the Metal Finishing Industry

Objective: The development and demonstration of advanced waste treatment technology to provide more effective, economical and/or compact systems for abating pollution in the metal finishing industry.

PROGRAM ELEMENT NO. 1B2036

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AHN-02	Full scale demonstration of destruction of cyanides in metal finishing wastes.	Demo Grant	6b	Lederman Rainwater
21AHN-06	Carbon adsorption demonstration for chromium removal from rinse waters.	Demo Grant	6b	Lederman Rainwater

Research Objective Achievement Plan 21ARE: Develop Technology to Achieve Recycle, Reuse and Closed-Loop Capability for the Metal Finishing Transportation and Equipment Industries

Objective: Determine problems of wastewater recycle, closed-loop systems with respect to process and/or wastewater. Ultimate goal being satisfactory treatment and recycle of wastewater to boiler feed systems, process water make-up, cooling tower make-up, etc.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ARE-05	Demonstration of ultrafiltration salt separation or other methods for treatment of central cutting oil system emulsion effluents to permit recovery and/or reuse of both phases.	Demo Grant	6b	Lederman Rainwater

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2037 – FOOD, PAPER, AND OTHER INDUSTRIAL SOURCES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 923,000
Contracts: $ 65,000

Program Element Output: New or improved methods for the abatement of water pollution caused by the discharge of wastes from a variety of "soft" industrial sources. These industries include, but are not limited to, paper and allied products, food and kindred products, stone, clay and glass products, in addition to other miscellaneous industrial sources. Program effort is being directed to achieve, at minimum cost, the equivalent of 85 to 99% removal of contaminants and the technology to achieve closed-loop systems for water reuse. Emphasis will be placed on advanced technology full-scale plant systems.

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PROGRAM ELEMENT NO. 1B2037

Research Objective Achievement Plan 21AKY: Demonstration of Closed Loop Industrial Wastewater and Water Systems in Kraft Pulp and Paper Production

Objective: The ultimate in waste control from the industry will be complete recycle and reuse of nonconsumptive water used in the complete industrial process. Interim needs must be satisfied by increasing degrees of treatment and control. Both in-house and extramural efforts will be directed toward new or improved treatment and control technology to satisfy immediate and near term needs and to progress toward the final objective of complete industry recycle. Full scale research and development demonstration projects employed will provide data to design, performance, capital investment and operation and maintenance costs. Economic impact of these measures on the industry will be evaluated.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKY-30	Demonstration of Kraft mill water recycle from various sources including scrubbers and condensates that permit minimal water and air pollution.	Demo Grant	6b	Lederman Rainwater

Research Objective Achievement Plan 21AKZ: Demonstration of Closed Loop Industrial Wastewater and Water Systems in Sulfite Pulp and Paper Production

Objective: The ultimate in waste control from the industry will be complete recycle and reuse of nonconsumptive water used in the complete industrial process. Interim needs must be satisfied by increasing degrees of treatment and control. Both in-house and extramural efforts will be directed toward new or improved treatment and control technology to satisfy immediate and near term needs and to progress toward the final objective of complete industry recycle. Full scale research and development demonstration projects employed will provide data on design, performance, capital investment and operation and maintenance costs. Economic impact of these measures on the industry will be evaluated.

PROGRAM ELEMENT NO. 1B2037

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKZ-12	Full scale demonstration of maximum closure of acid sulfite pulping system by reverse osmosis or appropriate alternate technique. (More than one project possible)	Demo Grant	6b	Lederman Rainwater

Research Objective Achievement Plan 21ALB: Demonstration of Closed Loop Industrial Wastewater Systems in Processing of Deinked Recycled Paper

Objective: The ultimate in waste control from the industry will be complete recycle and reuse of nonconsumptive water used in the complete industrial process. Interim needs must be satisfied by increasing degrees of treatment and control. Both in-house and extramural efforts will be directed toward new or improved treatment and control technology to satisfy immediate and near term needs, and to progress toward the final objective of complete industry recycle. Full scale research and development demonstration projects employed will provide data on design, performance, capital investment and operating and maintenance costs. Economic impact of these measures on the industry will be evaluated.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALB-04	Research demonstration to separate pigments, dyes, inks, short fiber (GW) fillers, etc., from deink digester and washing wastes. Investigation should employ techniques to close the wastewater loop in deinking mills.	Demo Grant	6b	Lederman Rainwater

PROGRAM ELEMENT NO. 1B2037

Research Objective Achievement Plan 21ALC: Demonstration of Closed Loop Industrial Water/Wastewater Systems in the Production of Paper Products

Objective: The implementation of closed-loop water/wastewater systems (the complete recycle and reuse of nonconsumptive water) is the ultimate objective in water pollution abatement in the paper products industry. The closed-loop system must be practical and create minimum air and solid waste pollution to be a useful contribution towards environmental improvement. Both in-house and extramural efforts will be directed toward new or improved treatment and control technology to satisfy immediate and near term needs while progressing towards closed-loop implementation. Full scale research and development demonstration projects will provide data on design, performance and cost. Economic impact on the industry and effect on product quality will be evaluated.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALC-06	Dry forming of coarse paper grades-pilot demonstration as an alternative to present "wet" techniques.	Contract	5	Lederman Rainwater

Research Objective Achievement Plan 21ALD: Demonstration of Closed-Loop Industrial Water/Wastewater Systems in the Production of Paperboard Products

Objective: The implementation of closed-loop water/wastewater systems (the complete recycle and reuse of nonconsumptive water)is the ultimate objective in water pollution abatement in the paperboard industry. The closed-loop system must be practical and create minimum air and solid waste pollution to be a useful contribution towards environmental improvement. Both in-house and extramural efforts will be directed toward new or improved treatment and control technology to satisfy immediate and near term needs while progressing towards closed-loop implementation. Full scale research and development demonstration projects will provide data on design, performance and cost. Economic impact on the industry and effect on product quality will be evaluated.

PROGRAM ELEMENT NO. 1B2037

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALD-06	Dry forming of paperboard, pilot demonstration as an alternative to present "wet" techniques.	Research Grant	5	Lederman Rainwater

Research Objective Achievement Plan 21ALE: Demonstration of Closed-Loop Industrial Wastewater Systems in Food and Kindred Products Processing Operations (Meat Products)

Objective: Develop closed-loop technology for the "meat products" industry through:

(1) Characterization of waste by unit processes.
(2) Unit process modifications to minimize waste.
(3) Development and demonstration of technology to increase by-product recovery.
(4) Development and demonstration of new and improved treatment technology.
(5) Development and demonstration of complete or unit process water recycle.
(6) Dissemination of new technological information to the industry.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALE-13	Develop and demonstrate a paunch drying and material handling system for small meat packing operations.	Research Grant	5	Boydston

PROGRAM ELEMENT NO. 1B2037

Research Objective Achievement Plan 21ALF: Demonstration of Closed-Loop Industrial Wastewater Systems in Food and Kindred Products Processing Operations

Objective: Use the extramural grant program to determine the technical and economic feasibility of producing "dairy products" (creamery butter, natural and processed cheese, condensed and evaporated milk, ice crean and frozen desserts and fluid milk) without discharging pollutants to the environment. Pilot plant and full scale demonstration projects will be utilized with emphasis placed on processing modifications, by-product recovery and complete treatment and reuse.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALF-09	Full scale demonstration of optimum system for production and recovery of feed-grade, single-cell protein by fermentation of whole and deproteinized acid cheese whey.	Demo Grant	6b	Boydston

Research Objective Achievement Plan 21ALG: Demonstration of Closed-Loop Industrial Wastewater Systems in Food and Kindred Products Processing Operations

Objective: Determine the technical and economical feasibility of producing canned and preserved fruits, vegetables and seafoods without discharging pollutants to the environment. A limited amount of in-house work coupled with extensive extramural effort will be devoted to processing modifications, by-product recovery, water use practices, inplant treatment and reuse as well as terminal treatment (secondary as well as "completed") and recycle. Both pilot plant and full scale demonstration projects will be utilized in an optimum fashion.

PROGRAM ELEMENT NO. 1B2037

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALG-22	Prepare state-of-the-art document on the prepared food industry delineating process unit operations major waste sources by unit operation, total waste discharges, and current treatment and disposal practices.	Research Grant	5	Boydston
21ALG-29	Develop commercially competitive by-products from fruit processing solid wastes (including waste activated sludge).	Demo Grant	5	Boydston

Research Objective Achievement Plan 21ALL: Demonstration of Closed-Loop Industrial Wastewater Systems in Food and Kindred Products Processing Operations

Objective: Determine the technical and economic feasibility of producing malt liquors, malt, wines, brandy, liquors, soft drinks, flavoring extracts, sirups, etc., without discharge of pollutants to the environment. Pilot plant and full scale demonstration projects (extramural) will be utilized on process modifications, by-product recovery systems, as well as, treatment and reuse schemes.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALL-16	Demonstrate wine production and bottling without discharge of liquid wastes and with utilization of the residuals for by-products.	Demo Grant	6b	Boydston

PROGRAM ELEMENT NO. 1B2037

Research Objective Achievement Plan 21ALN: Stone, Clay and Glass Products

Objective: Establish and document design, performance, operation and maintenance data for new and/or improved applications of pollution control technology on an industry-wide basis. A series of research, development and demonstration grants will be awarded to optimize process water use and reuse. Full scale demonstrations of the various manufacturing processes will be conducted.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALN-06	Elimination of cement manufacturing as a pollution source by removal of dust at a closed-loop industrial system.	Demo Grant	6b	Lacy
21ALN-09	Removal of wastewaters resulting from glass production by maximum reuse. Goal is a closed-loop industrial system.	Demo Grant	6b	Lacy

Research Objective Achievement Plan 21ALO: Demonstration of Closed-Loop Industrial Wastewater Systems for Wood Products Plants

Objective: Documentation of new or improved pollution abatement technology having industry-wide application, derived primarily from full scale research and development demonstration projects. Should include data on design performance and operation and maintenance costs. The economic impact resulting from implementation of technology by the industry should also be considered and such costs given. As necessary, surveys will be conducted for each of the subgroup industries to provide information on their waste characteristics and practices as to in-plant treatment versus external treatment.

PROGRAM ELEMENT NO. 1B2037

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALO-05	Demonstration of pollution control from "medium density" board and fiber board industry including reuse of fiber.	Research Grant	5	Boydston
21ALO-14	Determine cross-product uses of waste materials and increased recycle in particle board and plywood mills. Objective is closed-loop system.	Contract	6b	Boydston

Research Objective Achievement Plan 21ALP: Demonstration of Closed-Loop Industrial Wastewater and Water Systems for Miscellaneous Industrial Sources

Objective: Industry-wide abatement technology is to be formulated with the closed-loop system of treatment; the primary aim for this category. Full scale demonstration research and development projects are to provide new or improved pollution abatement technology which would include design data, process performance, chemical recovery techniques and operational and maintenance techniques for various treatment forms.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALP-35	Development of closed-loop commercial and/or non-commercial photographic processing system.	Demo Grant	6b	Boydston

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2038 – TRANSPORTATION SOURCES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 125,000
Contracts: See RFP when issued.

Program Element Output: Technology for the development of efficient and practical devices for the detection and prevention of pollution of the marine environment by watercraft (and other transportation sources) so as to enable industry to meet forthcoming and/or established standards. Program efforts will be concentrated on such pollutants as sanitary wastes, chemicals, oils, bilge waters, ballast waters, wash water and engine exhaust. This program will provide the necessary research to develop and evaluate prototype shipboard detection and anti-pollution devices, and prototype supporting onshore dockside facilities.

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PROGRAM ELEMENT NO. 1B2038

Research Objective Achievement Plan 21APK: Develop and Demonstrate Sanitation Devices for Vessels

Objective: Apply engineering research to develop and demonstrate practical marine devices for the treatment of sanitary waste from vessels. Such devices must be capable of meeting a no discharge standard or an effluent standard for suspended solids, BOD, and coliform commensurate with standards for municipal secondary treatment. Laboratory and shipboard evaluation will demonstrate that the devices can treat sanitary waste which present unique: loading variation and flow patterns, ship motion, weight and space limitations operational requirements, power limitations, the need for retrofit and repiping, marine safety and economics. Particular emphasis will be placed on the recreational watercraft and commerical vessels with crew complements of fifty (50) men or less.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APK-15	Install, operate and evaluate marine sanitation device onboard recreational watercraft. Submit final report summarizing results; 15 man-day flow thru treatment device.	Contract	5	Lederman
21APK-27	Implement grants for demonstration of new sanitation systems which meet the Federal vessel standard and significantly advance treatment technology.	Demo Grant	5	Lederman

Research Objective Achievement Plan 21APL: Development and Demonstration of On-Shore (Docking) Support Facilities for the Treatment and Disposal of Pumpout Waste from Watercraft and Waste Retention Systems

Objective: Develop and demonstrate small, effective, economical and easily operated on a seasonal basis treatment system for use at marinas and ports to adequately treat highly concentrated waste from watercraft waste retention systems, which contain deodorizing chemicals. Engineering research will establish basic waste characteristics requiring treatment and determine effects of such waste on ultimate treatment and disposal. Promising treatment systems or concepts will be developed and demonstrated at a representative marine facility.

PROGRAM ELEMENT NO. 1B2038

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APL-03	Demonstrate a suitable treatment system which is capable of handling pumpout waste from recreational vessel retentive devices. The demonstration will establish system effectiveness, operational reliability, maintenance requirements, operating and capital costs and sludge disposal needs. A final report will present results of this task.	Demo Grant	5	Lederman

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2039 – AGRICULTURAL SOURCES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 504,000
Contracts: See RFP when issued.

Program Element Output: Methods and management practices for abatement and control of pollution from agricultural sources. These sources include, among others, forestry and logging operations, agricultural and natural runoff, irrigation return flows, animal feedlot operations, and recreation facilities. Program efforts will include: (1) definition of the nature, extent and effects of pollution from the various sources; (2) development of mathematical models and improved cultural practices to mitigate the pollution; and (3) development of criteria for promulgating specifications and guidelines for design and operation of control procedures. Where applicable, complete recycle technology will be developed.

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PROGRAM ELEMENT NO. 1B2039

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-23	National Conference Cattle Waste Management for the purpose of disseminating up-to-date information, in concert with the American National Cattlemen's Association.	Demo Grant	5	Lacy

Research Objective Achievement Plan 21AOL: Guidelines to Prevent or Control Pollution from Forest and Logging Activities

Objective: A report(s) is needed which clearly and logically traces the nature of the pollution by qualitative identification and provides direct guidance for both future EPA-sponsored control projects, and immediate implementation of known improved management practices by the industry.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOL-04	Evaluate forest fertilization practices which include applications of urea, sulfur, phosphorus combinations in prill form for large areas of nutrient deficient land at application rates of several 100 to 450 lbs/acre. These studies will determine the ecological impact.	Demo Grant	6b	Nicholson

Research Objective Achievement Plan 21AOM: Development of a Pesticide Runoff Mathematical Model

Objective: Use a system analysis approach to predict pesticide behavior and attenuation in soil and to describe principal pesticide transport modes. The model, a resultant of a combination of a series of attenuation and pesticide transport sub-models, will be calibrated, tested and verified in the major geographical pesticide usage regions.

PROGRAM ELEMENT NO. 1B2039

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOM-30	Field test and verify the veracity of the model under conditions in the western region of corn belt. Permits testing, calibration and verification of pesticide runoff mathematical model under a different set of geographical and cropping conditions.	Research Grant	5	Nicholson

Research Objective Achievement Plan 21AOQ: Formulation of Math Sub-Models and Prerequisite Pesticide Behavior and Runoff Data

Objective: Investigate the various pesticide-soil interaction functions including adsorption/desorption, downward movement, volatility, chemical and microbial degradation kinetics and organism uptake and develop mathematical sub-models which portray the observed relations. The final analytical expressions will serve as inputs for the predictive Mathematical Pesticide Runoff Model.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOQ-11	Development of photochemical degradation sub-model. To formulate the test mathematical sub-models describing the behavior of pesticides in soils, several processes must be modeled. Photochemical degradation of surface applied pesticides and determination of those parameters associated with the process will be sub-modeled and serve as inputs into the predictive Mathematical Pesticide Runoff Model.	Contract	5	Nicholson

PROGRAM ELEMENT NO. 1B2039

Research Objective Achievement Plan 21APA: Demonstration of Land Disposal/Treatment Concepts for Animal Wastes from Small Operations

Objective: Develop/demonstrate economical manure and storm runoff treatment/disposal for small animal feeding operations. This area will be researched/demonstrated in the various major climatic areas. Many processes have been developed for large feeding operations. Some of these can be scaled down/developed/demonstrated as economical for small animal production units.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APA-07	Provide specific data for developing design criteria applicable throughout the Southeast for anaerobic lagoons, series lagoons, aerated lagoons, and plant-soil filters.	Demo Grant	6b	Nicholson
21APA-12	Demonstrate spray runoff treatment methods for runoff from Central Plains for beef cattle feedlot location in high rainfall area (40" plus).	Demo Grant	6b	Nicholson
21APA-13	Demonstrate spray runoff treatment methods for runoff from Central Plains beef cattle feedlot located in a moderate rainfall area (30").	Demo Grant	6b	Nicholson

Research Objective Achievement Plan 21APD: Waste Treatment — Land Disposal Systems for Poultry Wastes

Objective: Development and demonstration of an array of chemical, physical, and biological treatment systems for the control or removal of organics and nutrients as specified by parallel development of land disposal criteria for poultry wastes.

PROGRAM ELEMENT NO. 1B2039

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APD-04	Develop aerobic biological treatment systems coupled with appropriate land disposal methods for egg production wastes to be compatible with minimum available land areas, production management, geography, climate and operator expertise.	Demo Grant	6b	Nicholson

Research Objective Achievement Plan 21APE: Poultry Waste Pollution Control by Conversion, By-Product Recovery, or Reuse Systems

Objective: Develop physical, chemical and biological techniques and processing methods for the conversion of poultry wastes into acceptable products for reuse or recycle with special attention to potential problems of residues of heavy metals, drug, pesticides, metabolites, degradation products or similar potentially hazardous compounds.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APE-02	Develop a poultry waste handling system to include dehydration for recycle as a feed ingredient.	Demo Grant	6b	Nicholson

Research Objective Achievement Plan 21API: Determine the Water Pollution Implications of Commerical Aquaculture

Objective: Develop a state-of-the-art document to determine the waste loads, wastewater characteristics, water use, and water pollution problems and potential of commerical aquaculture.

PROGRAM ELEMENT NO. 1B2039

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21API-02	Develop a state-of-the-art document for the catfish production industry to determine the waste loads, wastewater characteristics, water use, water pollution problems, and the potential of the largest warmwater commerical agricultural industry-channel catfish.	Research Grant	5	Nicholson

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2040 – MINING SOURCES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $1,952,000
Contracts: See RFP when issued.

Program Element Output: Methods and management programs for the prevention, alleviation and abatement of water pollution caused by mineral extraction and mining activities. Program efforts will also be directed towards the development of criteria for the establishment of water quality standards. Demonstration projects will be initiated to determine the engineering feasibility and the economic vectors associated with large scale abatement and control measures.

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PROGRAM ELEMENT NO. 1B2040

Research Objective Achievement Plan 21AFY: Treatment of Mine Drainage

Objective: Development of processes, methods and techniques for treatment of acid mine drainage to provide an effluent of a quality compatible with stream and effluent discharge standards. Development of a suitable waste product disposal techniques and methods to minimize volume of waste produced from treatment processes. Demonstration grants will illustrate feasibility of developed processes on a large scale.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFY-37	Studies on the pilot plant purification of acid mine drainage using the neutralosis process.	Contract	6b	Convery

Research Objective Achievement Plan 21AGB: New Mining Methods

Objective: Develop and demonstrate operational and economic feasibility of new mining methods to prevent pollution from active and inactive mining.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AGB-07	Demonstration of the use of long wall mining to minimize environmental disturbances and water pollution from mining activities.	Demo Grant	6b	Convery

Research Objective Achievement Plan 21AGC: Small Drainage Basin Mine Water Pollution Control Demonstration

Objective: Contact States to explain Section 14. Assist States in determining suitable methods for demonstration, demonstration sites, funding, etc. Assist States in a monitoring program to measure effectiveness of methods. Award demonstration projects to States and monitor the projects.

PROGRAM ELEMENT NO. 1B2040

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AGC-09	Demonstration Grants to be awarded in FY-73 under Section 14 of Mine Drainage Control demonstration.	Demo Grant	14	Convery

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2041 – OIL AND HAZARDOUS MATERIALS SPILLS

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 385,000
Contracts: $1,120,000

Program Element Output: Technology for (1) the prevention of oil and hazardous material spills and (2) the detection, control and restoration of the water environment following accidental spills. Emphasis will be directed toward spill prevention and control methods at industrial complexes, storage terminals and major transportation sources. Methods will be developed for remote and congested areas, warm and cold climates and fresh and marine waters. Rapid detection and countermeasure techniques and methods for the ultimate disposal or recycling of oil and hazardous materials removed from spill sites will be demonstrated.

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PROGRAM ELEMENT NO. 1B2041

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-21	Develop new techniques for the re-refining of waste oils into economically saleable products, and to improve the existing technology for re-refining to eliminate the acid-sludge waste currently produced.	Contract	5	Lacy
PEMP-22	Develop new techniques for the re-refining of waste oils into economically saleable products, and to improve the existing technology for re-refining to eliminate the acid-sludge waste currently produced.	Research Grant	5	Lacy

Research Objective Achievement Plan 21ANQ: Offshore Oil Platform Spill Prevention

Objective: State-of-the-art review to evaluate existing equipment in use. Sampling program to identify and quantify flow conditions and effluent characteristics. Develop concepts to effectively treat effluent. Demonstrate capability of equipment to treat effluent. Increase reliability of platform operation equipment to decrease spill potential.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ANQ-04	Determine effluent characteristics including flow variation ranges, pressure variation, solids content, oil content, chemical and physical characteristics for offshore platform oil-contaminated water discharges.	Contract	5	Lederman

PROGRAM ELEMENT NO. 1B2041

Research Objective Achievement Plan 21ANR: National Conference on the Prevention and Control of Spills of Hazardous Materials

Objective: Organize a second National Conference to be held in FY-74 at a suitable site under the sponsorship of Environmental Protection Agency and one or more professional (*AIChE, ASCE, ACS*) or Trade (*MCA*) societies to exchange and update information and methods on the prevention and control of spills of hazardous materials.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ANR-04	Organize, schedule and hold FY-74 Conference on "Prevention and Control of Hazardous Material Spills".	Research Grant	5	Lederman

Research Objective Achievement Plan 21ANT: Equipment for Physically Removing Oil Spilled in the Environment

Objective: Define operating limitations of existing oil removal subsystem (pickup, pump, and oil/water separation systems). Establish design goals for the subsystems for operation in currents in excess of three knots and wave heights of two feet. Demonstrate capability of new and/or improved concepts to achieve design goals of oil skimming.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ANT-15	Demonstrate new prototype oil spill removal equipment capability to meet design goals established by on-going in-house research at National Environmental Research Center, Cincinnati.	Contract	5	Lederman

Research Objective Achievement Plan 21ANU: Development of Acoustical Methods to Test Stability of Earthen Lagoons Containing Hazardous Materials

Objective: Develop a technique that will correlate acoustical emissions (an index of strain) with hydraulic loading (stressing) of earthen lagoons to measure the instantaneous percent of stress-for-failure. Stressing of the earthen dike by the impounded liquid is accompanied by plastic deformations (shear) that cause acoustic emissions. The frequency and intensity of the emissions depends on the percent of load-to-failure, on the type and water content of the earth in the embankment, and on the structure of the dike.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ANU-03	Develop acoustical emission methods, determine significant parameters, and evaluate in scaled-down, test model earthen embankment.	Research Grant	5	Lederman

Research Objective Achievement Plan 21ANW: Hazardous Material Spill Environmental Evaluation

Objective: Under controlled field conditions and under actual spill conditions evaluate methods to be developed and already developed to: (1) control spills of hazardous materials on land; (2) detect and monitor spills of hazardous materials; (3) detoxify, destroy, recycle or immobilize recovered spilled hazardous materials; (4) control spills of hazardous materials in watercourses; (5) accelerate restoration of watercourses contaminated with spilled hazardous materials.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ANW-03	Evaluate, develop and modify methods to control spills of hazardous materials on land, and in watercourses, under controlled field conditions.	Contract	5	Lederman
21ANW-05	Develop, evaluate and modify methods to detect and follow spills of hazardous materials under controlled field conditions.	Contract	5	Lederman

PROGRAM ELEMENT NO. 1B2041

Research Objective Achievement Plan 21AOA: Methods to Prevent Spills of Hazardous Materials at Production Sites, Transportation Terminals and Storage Facilities

Objective: Develop methods and devices to prevent hazardous materials spilled into a municipal sewage system from reaching watercourses. Establish priority industries and their unit processes and operations for which the state-of-the-art does not provide adequate spill prevention techniques and devices by using historical data to determine frequency of spillage and environmental impact of spillage from each industry. Develop prototype devices and techniques for the priority processes and operations. Demonstrate and evaluate devices and techniques.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOA-03	Establish the priority industries and their unit processes and operations for which the "State-of-the-Art" does not provide adequate spill prevention techniques by using historical data to determine frequency of and environmental impact of spillage from each industry.	Contract	5	Lederman

Research Objective Achievement Plan 21AOD: Oil Pipeline Leak Detection

Objective: Perform state-of-the-art survey to determine current methods of leak detecting and limitations of these methods. Also included will be a study and evaluation of other potential techniques and methods. Define design limitations. Develop and demonstrate new techniques capable of detecting acute as well as chronic leaks.

PROGRAM ELEMENT NO. 1B2041

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOD-03	Develop new leak detection concepts for petroleum pipeline systems. Design objectives for these concepts defined by on-going research at National Environmental Research Center, Cincinnati.	Contract	5	Lederman

Research Objective Achievement Plan 21AOE: Chemical Identification of Oil Spills

Objective: Apply existing and newly developed instrumental technology and related methodology such as multi-detector gas liquid chromatography, high pressure liquid chromatography, infrared and ultraviolet spectrophotometry, mass spectrometry, and others, to the characterization, identification and quantification of petroleum oils and refined products in water, sediments, and biological tissues. Develop methods having established reliability in the presence of natural organics, weathering and biodegradation.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOE-10	Demonstrate prototype oil-concentration meter that will detect, record and monitor the quantity of oil in oil-contaminated water in the $5-500 ppm$ range.	Research Grant	5	Lederman

Research Objective Achievement Plan 21AOF: Oil Contaminated Water Recycling System

Objective: Extend the performance capabilities of several state-of-the-art oil/water separators, and develop several new separation systems; all through laboratory stage to pilot (50 *gpm*) stage. One or two of the most promising pilot stage systems will be developed through to a full-scale prototype stage (500 – 1,000 *gpm*).

PROGRAM ELEMENT NO. 1B2041

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOF-05	Develop pilot stage oily solids removal subsystems and free removal and finely dispersed oil removal subsystem.	Contract	5	Lederman
21AOF-06	Develop regenerable carbon adsorption system for removing chemically stabilized oil emulsions and dissolved oil fractions to produce water effluents with less than 10*ppm* oil content.	Contract	5	Lederman

Research Objective Achievement Plan 21AOG: Oil and Hazardous Materials Simulated Environment Test Tank (OHMSETT) Support

Objective: Provide a complete and usable Oil and Hazardous Materials Simulated Environmental Test Tank (**OHMSETT**) and data acquisition system. Supervise construction of the facility with outside contractors. Employ in-house personnel to design and purchase the data acquisition system and other basic supporting facilities.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOG-11	Develop data processing software and obtain data processing contract to handle the information generated during equipment testing at Oil and Hazardous Materials Simulated Environmental Test Tank (**OHMSETT**).	Contract	5	Lederman

Research Objective Achievement Plan 21AOH: Oil Spill Containment Devices

Objective: By laboratory studies, define physical parameters which effect the containment of oil slicks. Review state-of-the-art to determine current theory development. Develop and demonstrate new concepts for containment of oil slicks in currents with velocities in the range of two to six knots.

PROGRAM ELEMENT NO. 1B2041

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOH-04	Develop concepts for containing oil floating on water with currents in excess of 2.5 knots.	Contract	5	Lederman

Research Objective Achievement Plan 21AOK: Restoration of Oil Contaminated Beaches

Objective: Develop improved techniques for restoration of sandy beaches, rocky shorelines, mural areas and marshes including optimum balance between extent of treatment and overall ecological impact. Develop and demonstrate equipment for most suitable techniques.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AOK-03	Develop concepts for restoring sandy beaches.	Contract	5	Lederman

Research Objective Achievement Plan 21APU: Assessment of Damage Due to Oil Spilled in the Marine Environment

Objective: An investigation of equipment, techniques, and methods necessary to produce the best information for assessing damage to the marine environment. This research would include multiple aspects of the environment, i.e., physical-chemical, ecological and economic impact from the oil spill.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APU-03	Three-day symposium on sampling techniques, sample handling, analysis, and data interpretation relating to oil and hazardous material spills.	Research Grant	5	Lederman

PROGRAM ELEMENT NO. 1B2041

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21APU-04	Acquisition, testing and evaluation of sampling devices and techniques for investigating impact of spills on various marine environments.	Research Grant	5	Lederman

APPLIED SCIENCE AND TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1B2042 – HYDROLOGIC MODIFICATION

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: None
Contracts: See RFP when issued.

Program Element Output: Guidelines and procedures for optimum design, construction and operation of hydrologic modification projects which minimize environmental impact. Physical changes of water courses for flood control, hydropower, navigation and irrigation and local modifications of the water environment due to such things as dredging, construction and landfill operations must be compatible with demands on our finite water resources for water supply, waste dilution, recreation and wildlife. Research will include social, legal and institutional aspects as well as those of a technical nature. Reports and recommendations will provide a basis for development of planning and implementation programs.

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PROGRAM ELEMENT NO. 1B2042

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-06	Headquarters planning-state-of-the-art severity of problem/ hydrological modifications suggested approach to National problem.	Contract	6b	Lacy

SOLID WASTE TECHNOLOGY PROGRAM AREA

Research and development is conducted to control the health and environmental effects associated with solid waste materials and disposal thereof, to determine efficient methods of operating disposal programs, and to bring about a reduction in the amount of waste and unsalvageable materials produced on a national basis. Investigations are also conducted to determine means of recovering materials and energy from waste materials, to identify components and recoverable materials, and to identify and recommend methods for the reduction, neutralization, recovery or disposal of hazardous wastes, chemicals and pesticides.

Specifically, research and development are conducted on landfill disposal systems, incinerators, energy conversion processes, collection and transportation practices and resource recovery processes. Laboratory and field tests are conducted on landfills to determine analytical techniques for pollutant identification, leachate generation and control, gas generation and control, pathogen control, and settlement. Incinerator techniques and energy conversion processes are studied to upgrade existing technology, determine methods for utilization of waste material as a fuel, and investigate pyrolysis techniques for production of useful gas or oil products from organic materials.

In the area of collection and transportation practices, theoretical models are developed and are verified in actual characteristic urban areas to enable municipalities to improve the effectiveness of urban solid waste handling practices. The control and reuse of demolition materials is studied, as well, to produce recommended strategies for increased reuse, to seek alternative uses, and to evaluate source reduction techniques and socio-economic considerations.

In-house pilot plant work is conducted to study unit processes and system configurations to accomplish materials extraction and recovery from municipal refuse. Supporting strategy-type studies are conducted to investigate options to recover selected materials or combined fractions of materials. Processing methods for separating, upgrading converting and utilizing materials suitable for recovery are developed to optimize effective and economical techniques.

SOLID WASTE TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1D2063 – COLLECTION AND PROCESSING TECHNOLOGY

Funds: Available as of October 6, 1972 for support of listed Tasks:

Grants:	$ 155,000
Contracts:	$ 117,000

Program Element Output: (1) Storage, collection and transportation technologies for both residential and commerical solid waste management; (2) new or improved processes for efficient reduction of the amounts of solid wastes which must be disposed, including combustion, densification and separations systems. These technologies will be used for the purpose of establishing standards and for planning and implementing programs relating to ultimate disposal and recycling schemes. Potential markets for materials reclaimed from residential, industrial and agricultural wastes will be identified.

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PROGRAM ELEMENT NO. 1D2063

Research Objective Achievement Plan 02AAE: Effectiveness and Modeling of Urban Storage, Collection and Transportation Practices

Objective: Via selected contracts and research grants, collection, transportation, and storage methods of urban areas will be improved by providing practical methods for optimizing collection vehicle routing and districting. A theoretical model to measure the effectiveness of existing and developed methods will be developed in four contracts.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
02AAE-04	To develop a computer program utilizing mathematical optimization and heuristic algorithms for routing of collection vehicles.	Research Grant	204	Stenburg
02AAE-06	To develop criteria to measure the effectiveness of urban refuse storage, collection, and transportation practices.	Contract	204	Stenburg

Research Objective Achievement Plan 24AIO: To Develop an Incinerator Test Facility which will Permit Evaluation of Operating Parameters, Emissions and Construction Materials

Objective: By employing a combination of research grants, contracts, and in-house work, the necessary knowledge on operating parameters, emissions and materials that are associated with the thermal degradation of municipal solid waste will be obtained and developed.

PROGRAM ELEMENT NO. 1D2063

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
24AIO-11	Experimental and theoretical program to develop criteria for the design and control of municipal incinerators.	Research Grant	204	Stenburg
24AIO-14	Testing capability to investigate the operating parameters associated with the incineration of municipal solid wastes.	Contract	204	Stenburg
24AIO-15	To study the corrosion problems and relation of the corrosion rate to the combustion conditions.	Research Grant	204	Stenburg

SOLID WASTE TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1D2064 – DISPOSAL TECHNOLOGY

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 212,000
Contracts: $ 70,000

Program Element Output: Guidelines and/or policy decisions for sanitary landfill design, construction and operation. Recommendations will be developed relative to dry versus wet land disposal and cover versus no cover landfill practices. Program efforts will produce methods for identification and control of gases and methods for the control and treatment of leachate. Reports will be compiled on pathogen survival, movement and control; and design criteria will be established for settlement. This program will be conducted at both laboratory and field scales.

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PROGRAM ELEMENT NO. 1D2064

Research Objective Achievement Plan 01AAC: Develop a Comprehensive Understanding of Solid Waste Disposal in Sanitary Landfills and of the Environmental Impact of Landfills

Objective: Investigate at laboratory and field scale those areas in land disposal technology where necessary scientific knowledge is lacking. Specifically, determine analytical techniques for pollutant identification; leachate generation, movement, treatment and control; gas generation, movement and control; pathogen survival, movement and control; settlement prediction and control. A combination of in-house, contract, and grant mechanisms will be used in discrete tasks to accomplish these objectives.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
01AAC-14	Determine organic and metal characteristics of leachate from selected landfills in the U.S.	Contract	204	Graham
01AAC-22	Determine gas production rates, refine gas movement predictive models and develop a rational method for designing gas movement controls with field verification.	Research Grant	204	Graham
01AAC-23	Develop predictive settlement equations for unprocessed solid waste based on reported field data for use in sanitary landfill design criteria.	Contract	204	Graham
01AAC-24	Develop and evaluate predictive models of moisture movement in landfill cover material.	Research Grant	204	Graham
01AAC-25	To provide laboratory support to characterize organics and heavy metals found in samples from Boone County Field Site.	Contract	204	Graham

SOLID WASTE TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1D2311 – HAZARDOUS SOLID WASTES

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: See RFP when issued.

Program Element Output: Techniques for the characterization, collection, treatment and disposal of hazardous waste materials. These wastes may include, among others: industrial and chemical wastes, hospital wastes, pathogenic wastes, pesticides and pesticide containers and radioactive materials. An inventory of possible disposal sites for these materials will be compiled.

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PROGRAM ELEMENT NO. 1D2311

Research Objective Achievement Plan 06ALR: Development of Techniques for the Characterization, Treatment and Disposal of Hazardous Waste Materials Including Pesticides

Objective: Develop techniques for the characterization, treatment and disposal of selected hazardous waste materials that are not presently being disposed of properly. Handling and disposal systems that are presently being used successfully for some hazardous waste materials will be applied to the materials with similar properties among the aforementioned selected group. Laboratory and pilot scale investigations will be carried out on others on the list. The selected materials include, but are not limited to, industrial chemical wastes, pathogenic wastes, and a wide variety of pesticides and pesticide containers. Disposal will include techniques for controlling the collection of these materials.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
06ALR-07	Conduct research to design a system for collection and disposal of pesticides and pesticide containers.	Contract	204	Graham

SOLID WASTE TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1D2314 – RESOURCE RECOVERY TECHNOLOGY

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $ 179,000

Program Element Output: (1) Methods and implementation-activities which will stabilize the quantities of solid waste being generated; (2) systems which will allow greater percentages of solid waste material collected to be recycled by energy recovery, material reuse, and materials conversion. The efforts of this element are related to four basic areas: solid waste generation behavioral studies, incentive studies, resource conservation studies, and reclamation technology development. Emphasis will be placed on shifting the relative economics of resource recovery by internalizing the external costs involved in virgin materials extraction and processing and in disposal.

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PROGRAM ELEMENT NO. 1D2314

Research Objective Achievement Plan 05ABZ: Field Test and Analysis of Prepared Solid Waste as a Fuel in a Variety of Power and Heating Boilers

Objective: Based on the results of ongoing work, additional grants and contracts will be solicited to utilize solid waste as a fuel. The initial work will concern itself with the preparation of the waste for combustion. The second phase will be an evaluation of the combustion characteristics of the prepared refuse by actual field tests in various types of boilers.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
05ABZ-03	To survey existing heat generation plants for selection as potential field test sites. To evaluate prepared solid wastes as a fuel. Develop field test program including definition of prepared solid waste type condition, etc.	Contract	204	Stenburg

Research Objective Achievement Plan 06AKO: Stimulation of Private Industry to Improve Resource Recovery Technology

Objective: (1) Determine quality specifications necessary for acceptance of secondary materials by primary producers and develop standardized testing procedures to evaluate quality of materials; (2) identify manufacturing, processing, and recycling technological problems that are inhibiting use of recovered materials; and (3) develop case studies for more important problems.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
06AKO-04	To determine the role of transportation in resource recovery.	Contract	204	Graham
06AKO-06	To develop extensive case studies of four of the problem areas identified in task 04.	Contract	204	Graham

AIR POLLUTION CONTROL TECHNOLOGY PROGRAM AREA

The primary objective of this program area is to assure the availability of control devices, processes, and approaches for control of air pollutants at their source. Programs range in scope from basic research and development activities through the design, construction, and operation of full-scale demonstration systems. Research, development, and demonstration programs are implemented principally through contracts with industrial firms and other governmental agencies. Approximately 10% of the research is conducted in in-house facilities. Portions of the more long-range and fundamental research and development activities are conducted through research grants with non-profit organizations, principally colleges and universities.

The air pollution control technology activities are currently grouped into four principal areas: (1) sulfur oxides, (2) nitrogen oxides, (3) particulates, and (4) hazardous and other pollutants.

A major portion of the program is devoted to research and development of technology for the control of sulfur oxide emissions. Historically, this research has focused on control of sulfur oxide emissions from electric power generating plants. More recently, increased attention is being given to the control of industrial combustion and industrial process sources.

Activity on nitrogen oxide control research is expanding rapidly to support control technology needs and regulatory requirements. The primary thrust of the ongoing nitrogen oxide research and development is in the area of combustion control. Increasing attention is being given to nitrogen oxide effluent treatment processes.

Particulate control research and development must cope with the needs for fine particulate control technology and improved and more economic conventional technologies. Reliable methods for measuring fine particulate as well as the development of high efficiency methods and equipment for controlling fine particulates in the 0.05 to 3.0 micron size range are being emphasized.

The hazardous and other pollutant control category embraces control technology for all air pollutants not classified within one of the above three categories. This includes the development of technology for control of hydrocarbons from stationary source, halides, and similar pollutants. Special emphasis is being placed on the control of hazardous and potentially hazardous pollutants including mercury, beryllium, asbestos, cadmium, vanadium, chromium, lead, etc.

AIR POLLUTION CONTROL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1A2012 – PARTICULATE CONTROL

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 125,000
Contracts: $1,060,000

Program Element Output: Effective and practical processes and methods for the prevention or control of particulate air pollution. Program efforts will be to upgrade the principal present control techniques (including electrostatic precipitation, fabric filtration, and wet scrubbing) to satisfactory emission control levels and to develop new technology to cope with fine particulate emissions. Modified and new devices will be tested at a pilot scale, and successful collection techniques will then be demonstrated at full scale on industrial emission streams.

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PROGRAM ELEMENT NO. 1A2012

Research Objective Achievement Plan 21ADJ: Conventional Effluent Treatment Technology Development (Particulate)

Objective: Following state-of-the-art device studies, mathematical models of each device type will guide development of improved designs, which will be bench tested and then demonstrated at pilot scale on particulate emission sources.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADJ-05	Develop modifications to existing scrubber types for more efficient utilization of scrubbing liquid.	Contract	104	Burchard
21ADJ-55	Develop new non-woven filter media and evaluate the multi-layer concept.	Research Grant	104	Burchard
21ADJ-57	Determine basic particulate collection mechanisms for high velocity mat and cake filtration.	Research Grant	104	Burchard
21ADJ-81	Develop instruments for determining the size distribution of scrubbing liquor drops *in situ.*	Contract	104	Burchard
21ADJ-82	Improved measurement techniques for the characterization of asbestos emissions.	Contract	104	Burchard

PROGRAM ELEMENT NO. 1A2012

Research Objective Achievement Plan 21ADL: Fine Particulate Control Technology Development

Objective: The two fundamental approaches to the fine particle problem are: (1) to increase the particles to a size suitable for collection in conventional equipment and (2) to utilize an additional force to accomplish removal. In the first category, Control Systems Division will study condensation scrubbing and sonic agglomeration as means of increasing particle size. Electrostatic droplets and magnetic techniques are examples of approaches for providing high intensity force fields that will be investigated. Work using thermo and diffusio-phoresis and novel devices will also be conducted.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADL-04	Evaluate performance, economics, and feasibility of novel fine particulate control devices.	Contract	104	Burchard
21ADL-06	Determine feasibility of growing submicron particles for collection by electrostatic precipitators.	Research Grant	104	Burchard
21ADL-17	Identify and utilize as appropriate other government agency particulate research and development capabilities.	Contract	104	Burchard
21ADL-18	Develop fine particulate measurement instrumentation for field use to yield particle size/efficiency data.	Contract	104	Burchard

PROGRAM ELEMENT NO. 1A2012

Research Objective Achievement Plan 21ADM: Effluent Treatment Technology Characterization (Particulate)

Objective: Particulate treatment technology characterization will be obtained by (1) testing of existing control devices at plant sites, (2) testing existing and new devices in a controlled environment, (3) testing flexible standard control devices on new or additional control situations. Measurement support will provide techniques that will allow evaluation of collector efficiencies at various particle size ranges.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADM-10	Develop performance and economic data for industrial applications of fabric filters.	Contract	104	Burchard
21ADM-13	Provide *in situ* particle resistivity measurement instrumentation for electrostatic precipitator study contracts.	Contract	104	Burchard
21ADM-16	Design, construct and operate a standardized flow system and gas source for testing of particulate control devices.	Contract	104	Burchard
21ADM-17	Design, construct and operate standard control devices for testing controlability of industrial sources.	Contract	104	Burchard

AIR POLLUTION CONTROL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1A2013 – SO_x CONTROL

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 159,000
Contracts: $4,940,000

Program Element Output: Technology for the control of sulfur oxide emissions with technical and economic characteristics capable of providing levels of control necessary to meet ambient air quality and new source performance standards. The principle approaches will include flue gas treatment processes and fuel cleaning techniques. Control technology development and demonstration will address both the control of major point sources and smaller area sources. Primary attention will be given to regenerative processes since they offer technical and economic advantages for power generation, conserve natural resources and result in reduced waste products.

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PROGRAM ELEMENT NO. 1A2013

Research Objective Achievement Plan 21ACX: Effluent Treatment Technology Development (SO_x)

Objective: A comprehensive development program emphasizing pilot scale testing and evaluation of the most promising SO_x control technology identified is planned. Control processes which are applicable to (1) electric utilities, (2) industrial, commercial and residential combustion sources, and (3) industrial process sources have been emphasized. A variety of supporting studies and experimental programs also is planned to help advance the state-of-the-art SO_x control technology on a broad basis.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ACX-40	Modify in-house 300 *cfm* pilot plant and perform experimental studies to evaluate the double alkali control process.	Contract	104	Burchard
21ACX-61	Develop an engineering study of methods for elimination of NH_3-SO_x particulate fume from ammonium bisulfate scrubbing.	Contract	104	Burchard
21ACX-80	Conduct test program on Bahco Lime Scrubbing Unit.	Contract	104	Burchard
21ACX-83	Develop a process for economically removing SO_x from flue gas of small oil or coal-fired furnaces (less than 3400 *pph* steam).	Contract	104	Burchard
21ACX-84	By means of laboratory studies, define mechanism of oxidation encountered in flue gas scrubbing with clear alkali solutions; also develop best method oxidation retardation and implement in an SO_2 control facility demonstration program.	Contract	104	Burchard

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ACX-86	Advance the state-of-the-art of entrainment separators by; assessing status of current technology, developing improved separators and pilot testing improved systems.	Contract	104	Burchard
21ACX-92	Develop procedures and systems for stratified gas monitoring for both SO_x and NO_x.	Contract	104	Burchard
21ACX-94	Determine the effect of SO_x control processes on the emission of hazardous and trace elements.	Contract	104	Burchard

Research Objective Achievement Plan 21ACY: Lime/Limestone Scrubbing Technology Development (SO_x)

Objective: A comprehensive wet lime/limestone prototype facility test program is planned at the Shawnee Steam Plant (TVA). Tests will be performed on three parallel scrubber circuits using lime and limestone under various operating conditions. The test program will be supported by concurrent scaling studies, in-house pilot plant work, sludge disposal studies, test support, etc.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ACY-34	Define and evaluate ecologically and economically attractive means of sludge disposal from lime/limestone scrubbing operations.	Contract	104	Burchard

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ACY-36	Provide test support for EPA prototype lime/limestone wet scrubbing facility at Tennessee Valley Authority Shawnee Steam Plant.	Contract	104	Burchard
21ACY-41	Develop mathematical model of SO_2 and particulate removal in a mobile bed (TCA) scrubber.	Research Grant	104	Burchard
21ACY-42	Develop automatic process control loops, sampling sites, etc., to permit continuous trouble-free operation of lime/limestone wet scrubbing systems.	Contract	104	Burchard

Research Objective Achievement Plan 21ADC: Industrial Processes Control Development (SO_x)

Objective: The Research Objective Achievement Plan provides for the solicitation, evaluation and development up to, but not including commercial scale demonstration, of industrial process control technologies for the removal of sulfur oxides and associated compounds from petroleum refineries, non-ferrous smelters, pulp mills and sulfuric acid plants. The tasks include raw materials substitution, processing modifications, and effluent gas stream cleaning approaches to pollution control. Both a long range and shorter term approach are included. Consideration was given to economics, process applicability and potential for undesirable byproducts in task selection.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADC-07	Develop add-on control techniques for all significant pulp mill reduced sulfur compounds.	Contract	104	Burchard
21ADC-08	Develop a non-sulfur pulping process.	Contract	104	Burchard

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADC-09	Develop an alternative to existing Kraft recovery furnace-pyrolysis combustion.	Contract	104	Burchard
21ADC-10	Evaluate in-digestor black liquor oxidation.	Research Grant	104	Burchard
21ADC-12	Test in-digestor black liquor oxidation on a batch digestor pilot plant.	Contract	104	Burchard
21ADC-30	Devise and compare alternative approaches to total SO_x control at refineries. Implement the best alternatives.	Contract	104	Burchard
21ADC-31	Develop a process for the catalytic reduction of SO_2 from the catalytic cracker catalyst regeneration unit by carbon monoxide from the same unit.	Contract	104	Burchard
21ADC-56	Develop a means of treating copper ore with steam to produce hydrogen sulfide which will be reacted with sulfur dioxide from other smelter operations.	Contract	104	Burchard
21ADC-57	Develop a new copper refining process based on leaching concentrates with a sodium sulfide—potassium sulfied eutectic followed by electrolytic removal of the copper.	Research Grant	104	Burchard

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADC-59	Develop and demonstrate add-on smelter emission control process.	Contract	104	Burchard
21ADC-81	Measure SO_2 and other emissions from the Coulton chemical sulfuric acid plant which is equipped with the PuraSiv-S process for SO_2 emission control.	Contract	104	Burchard

Research Objective Achievement Plan 21ADD: Clean Fuels Technology Development (SO_x)

Objective: Techniques for the control of SO_x emissions from a broad spectrum of industrial and utility combustion sources via the development of fossil fuel (coal and oil) desulfurization and effluent desulfurization alternatives will be examined for their potential to provide technically feasible and economically sound methods for the achievement of present and future air quality standards with optimum use of fuel resources. Support will be provided to establish the environmental soundness of clean fuel techniques which are being developed under other Government supported work, when necessary to achieve environmental objectives, projects for the production of clean fuels will be supported by Environmental Protection Agency.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADD-AB	Pilot plant development of a coal desulfurization process using a chemical hydrotreating technique.	Contract	104	Burchard
21ADD-BB	Provide engineering analysis for the submerged combustion demonstration.	Contract	104	Burchard

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADD-BF	Demonstration of the *CAFB* atmospheric gasifier for generation of a clean fuel gas from residual oil for use in an existing (or new) combustor.	Contract	104	Burchard
21ADD-24	Determine pollutant fate during coal gasification in IGT Hygas process.	Contract	104	Burchard
21ADD-30	Evaluate the impact upon clean fuel generation of *Lurgi* gasification process.	Contract	104	Burchard
21ADD-70	Determination of the distribution of inorganic constituents in coal.	Research Grant	104	Burchard
21ADD-96	Determine applicability of chemical extraction techniques to the desulfurization of U. S. coals.	Contract	104	Burchard

Research Objective Achievement Plan 21AFJ: Mechanical Coal Cleaning Process Demonstration

Objective: A prototype (commercial demonstration) plant will be designed, built and operated. Support research and development will be continued to improve the process, and advanced coal cleaning techniques.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFJ-07	Technical review and evaluation of mechanical coal cleaning techniques.	Contract	104	Burchard

PROGRAM ELEMENT NO. 1A2013

Research Objective Achievement Plan 21AQQ: St. Louis Combined Refuse/Coal Combustion Demonstration

Objective: Municipal refuse processing, storage, transport and utility boiler firing facilities will be constructed and operated under a demonstration grant to the City of St. Louis. Refuse will be shredded and tangentially fired as an auxiliary fuel in a powdered coal burning boiler. Air pollution, boiler corrosion and boiler performance studies will be made to support the demonstration and to extend the use of municipal waste fuels to other boiler-firing configurations. Work will be conducted in conjunction with activities of Environmental Protection Agency, Office of Solid Waste Management Programs.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQQ-04	Evaluation of intermediate sized refuse-fossil fuel boilers to replace uncontrolled apartment house and small commercial incinerators. Boilers will provide central heating-air conditioning and reduce area source air pollution.	Contract	104	Burchard

Research Objective Achievement Plan 21AQR: Iron and Steel Industrial Process Control Development

Objective: The sources in the iron and steel industry will be systematically approached in order of decreasing need. At the same time, consideration will be given to current water and solid waste pollution as well as the potential formation of new pollution. For many of the sources engineering evaluations will be performed for determining the best approach. Demonstrations are included for planning purposes; however, it is expected that at the power decision point specific Environmental Research Objective Statement **(EROS)** will be prepared for each demonstration. Maximum utilization will be made of both co-funding with industry and PL-480 funds to meet the objectives.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQR-05	Demonstrate sinter plant recycle system.	Contract	104	Burchard

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQR-09	Prior to full scale demonstration of coke made by low-pollution continuous process, determine whether the coke is suitable for use in blast furnaces.	Contract	104	Burchard

AIR POLLUTION CONTROL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1A2014 – NO_x CONTROL

Funds: Available as of October 6, 1972 for support of listed Tasks:

Grants:	$ 106,000
Contracts:	$1,034,000

Program Element Output: Effective and practical processes and methods for the prevention of NO_x emissions from stationary sources by the modification of combustor design and combustion processes. The goal is to develop and demonstrate technology which will provide the capability of achieving 75% control of NO_x emissions from major point sources.

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Research Objective Achievement Plan 21ADF: Effluent Treatment Technology Development (NO_x)

Objective: NO_x emissions from gas-fired combustion sources will be controlled by a catalytic reduction process; coal or oil-fired sources by either an equeous absorption process or a catalytic reduction process; and non-combustion sources by adapting the molecular sieve absorption process presently being demonstrated for nitric acid plant control (see ROAP 21ADH) or by adapting the aqueous absorption or catalytic reduction process to be developed for combustion sources (this ROAP).

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADF-03	Review and assess the technical and economic feasibility of using catalysts to control NO_x (and perhaps SO_2) emissions from utility and industrial furnaces which burn coal or oil.	Contract	104	Burchard
21ADF-04	Continue the development of an oxidative scrubbing process for controlling NO_x emissions (not SO_2) from all utility and industrial combustion and non-combustion sources.	Contract	104	Burchard
21ADF-06	Determine the technical and economic feasibility of a catalytic reduction process (based upon a metal sulfide catalyst and CO or NH_3 as the reductant) to control NO_x emissions (not SO_2) from all utility and industrial combustion and non-combustion sources.	Research Grant	104	Burchard

PROGRAM ELEMENT NO. 1A2014

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADF-10	Determine the technical and economic feasibility of a catalytic reduction process (using NH_3 as the reductant) for simultaneously controlling NO_x and SO_2 emissions from utility and industrial furnaces which burn coal or oil.	Contract	104	Burchard

Research Objective Achievement Plan 21ADG: Combustion Control Technology Development (NO_x)

Objective: The major emphasis will be to develop combustion modification technology for control of nitrogen oxides and related combustible emissions (C, CO, HO) from all conventional combustion systems. A lesser but significant effort will be made to establish the technical and economical feasibility of novel low air pollution generating concepts for replacement of conventional combustion equipment and fuels. As an integral part of these studies, a fundamental combustion research program will be established to provide the basic understanding of the combustion process required in all EPA combustion research and development activities.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADG-08	To define the mechanisms and kinetics of fossil fuel bound nitrogen conversion to nitrogen oxides and other products.	Contract	104	Burchard
21ADG-16	To develop heat transfer and radiant emission calculations for use in mathematical simulations of combustion.	Research Grant	104	Burchard

PROGRAM ELEMENT NO. 1A2014

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADG-17	To establish the role of localized diffusion burning on NO formation in droplet and particle burning.	Research Grant	104	Burchard
21ADG-20	To determine the effect of combustion conditions on the formation and destruction of condensible pollutants (PNA) and other products of combustion.	Contract	104	Burchard
21ADG-41	To determine the most promising combustion modification techniques for control of NO_x emissions in pulverized coal combustion (B&W).	Contract	104	Burchard
21ADG-48	To develop probe techniques for determination of chemical composition, temperature and turbulence in flames.	Contract	104	Burchard
21ADG-83	Develop economical combustion control technology to control NO_x from industrial steam raising package boilers and heaters.	Contract	104	Burchard
21ADG-84	Study the feasibility of applying automotive developed combustion modification to stationary gas turbine and internal combustion engines.	Contract	104	Burchard

Research Objective Achievement Plan 21ADH: Demonstration of NO_x Control Using Molecular Sieves

Objective: Molecular sieve technology will be applied to a U.S. Army Ammonia Oxidation Process (AOP) nitric acid plant in order to demonstrate that nitrogen oxide emissions can be reduced by at least an order of magnitude below the level attainable with existing technology. It is anticipated that the reduced emission level can be accomplished at a cost that is lower than the use of current technology which makes use of catalytic reduction systems.

PROGRAM ELEMENT NO. 1A2014

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ADH-03	Develop process (molecular sieve) specification; cost and industry-wide applicability manual.	Contract	104	Burchard

AIR POLLUTION CONTROL TECHNOLOGY PROGRAM AREA

PROGRAM ELEMENT NO. 1A2015 – CONTROL TECHNOLOGY – OTHER POLLUTANTS

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $1,340,000

Program Element Output: Control technology for air pollutants such as hydrocarbons, halides, carcinogens, carbon monoxides, hazardous and other pollutants which are deemed to be significant and require source and area control. Development and demonstration of control technology for odors, products of incineration, and hazardous and other pollutants from industries including graphic arts, phosphate rock, organic chemicals, glass and ceramics, aluminum, paint and varnish, petrochemicals, electrochemicals, food and other miscellaneous industries will be undertaken.

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PROGRAM ELEMENT NO. 1A2015

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-08	Technology assessment and planning support for the hazardous and other pollutant control strategy which involves the characterization of emissions with respect to sources, control technology and other data, to aid in establishing priorities and research and development goals.	Contract	104	Harrington
PEMP-09	Technology assessment and planning support for the development of a noise control research and development strategy. This would include identifying existing control technology capability; identifying voids in control technology which will aid in establishing priorities and research and development goals.	Contract	104	Harrington

PROGRAM ELEMENT NO. 1A2015

Research Objective Achievement Plan 21AFA: Other Major Pollutant Control Technology Development

Objective: Each of the pollutants that were specified by the Environmental Research Objective Statement (Cd, asbestos, HG, Pb, fluorine) will be characterized in order to identify chemical and physical properties, important sources and emission levels, potential applicability of existing control technology, and the need for additional control technology development. Systems studies will lead to the design, research and development of required new technology. Process modifications that would preclude the emission of pollutants will also be considered as a potential control method.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFA-04	Characterization and control of asbestos emissions from open mine faces, dumps and storage areas.	Contract	104	Burchard
21AFA-06	Assess the capability of particulate control technology process modifications to effectively reduce asbestos emissions from manufacturing operations.	Contract	104	Burchard
21AFA-25	Development of process modifications for removal of mercury from non-ferrous metal ore concentrates prior to roasting.	Contract	104	Burchard
21AFA-29	Demonstration of commercial proprietary processes for removal of mercury from chlor-alkali plant emissions.	Contract	104	Burchard
21AFA-76	Define the requirements for control of high temperature fluoride and trace metals emissions.	Contract	104	Burchard

PROGRAM ELEMENT NO. 1A2015

Research Objective Achievement Plan 21AFB: Odor Control Technology Development

Objective: The approach involved: development of accurate and reliable methods for odor measurement; engineering analysis of the state-of-the-art of existing control technology and research and development needs; and laboratory, theoretical and pilot plant studies of selected control techniques to generate design data for the construction of economical and efficient odor control systems will be conducted.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFB-09	Assess solid/liquid separation methods, solid waste drying methods and establish design criteria for odor control of cattle feed lots.	Contract	104	Burchard

Research Objective Achievement Plan 21AFC: Emission Control Technology Characterization

Objective: Uniform methods for sampling and analysis of first priority hazardous and other pollutants will be made available to insure comparability of data. Samples will be obtained by the contractors responsible for development and demonstration of control processes for SO_x, NO_x, and particulate. Additional data available from industry and within EPA will be compiled and evaluated. Comparisons will be made of all processes to determine the capability of each for controlling hazardous and other pollutants. Development of improved design and/or operation of processes will be implemented to provide maximum cost effective multi-pollutant control.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFC-04	Provide sampling and analytical methods, coordination of sample acquisition and support for all measurements programs related to hazardous emission control technology characteristics.	Contract	104	Burchard

PROGRAM ELEMENT NO. 1A2015

Research Objective Achievement Plan 21AFD: Hydrocarbon Control Technology Development

Objective: Laboratory, pilot plant and prototype studies will be conducted to develop the knowledge of adsorption mechanism, design data, cost data and performance reliability for the design of low cost control systems for hydrocarbon emission control. Where specific source application is required, it will be accomplished with close cooperation with the concerned industry.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFD-08	Generate design data for the construction of economic package control devices for hydrocarbon emission control of small sources.	Contract	104	Burchard
21AFD-12	Develop and demonstrate efficient and economical control of hydrocarbons from a bulk loading terminal.	Contract	104	Burchard

Research Objective Achievement Plan 21AFE: Industrial Process Control Technology Development for Hazardous and Other Pollutants

Objective: A two-phased effort addressing a wide range of first and second priority hazardous and other pollutants emitted from approximately fifty significant industrial process sources (defined in Environmental Research Objective Statement 21AFE and 21ADC) will be performed. Phase I will direct engineering studies and sampling and analytical tests to the characterization of emissions and to the identification of additional research, development and demonstration required to provide adequate control technology in many air pollution areas not previously considered in depth by EPA. Under Phase II the control technology needs identified under Phase I will be developed and evaluated through the pilot scale.

PROGRAM ELEMENT NO. 1A2015

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AFE-06	Characterize emissions, identify research and development requirements, recommend specific control technology research and development tasks for selected industrial sources.	Contract	104	Burchard

IMPLEMENTATION RESEARCH PROGRAM AREA

This area includes research that will assist EPA in implementing its environmental protection responsibilities. This includes examining alternative approaches to environmental protection; supporting social and economic research; identifying new pollution control needs and alternate control strategies; and estimating direct social, physical, and economic cost impacts of environmental pollution.

Economic Analysis develops and applies improved data and techniques for benefit/cost evaluations of pollution control.

Standards Research focuses on developing improved methodology for setting and implementing environmental protection standards.

Ecological Studies and Technology Assessment focuses on research that will assist the EPA in carrying out its responsibilities under the National Environmental Policy Act (NEPA) of 1969, as well as carrying out other ecological studies primarily of a non-economic nature.

Systems Evaluation includes research on fiscal and other non-NEPA alternatives to standard setting to implement environmental protection.

IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1A1004 – ECONOMIC CRITERIA

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Development of an economic basis for environmental decision-making as it relates to air pollution. To accomplish this goal, the following functions are to be performed: (1) provide Congress, EPA, and the public a comprehensive annual study of the economic consequences of Federal Air Pollution Legislation; (2) evaluate and propose inducements to control air pollution; (3) investigate the economic consequence of specific situations associated with air pollution abatement; (4) conceptualize and assess, in economic terms, the benefits to be derived from air pollution abatement; (5) provide economic information necessary for the development and implementation of air pollution regulations; and (6) investigate, explain and predict the relationship of cleaner air to other environmental and economic goals.

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IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1B1030 – WATER QUALITY IMPLEMENTATION RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:

Grants:	$ 235,000
Contracts:	$ 650,000

Program Element Output: (1) Effective planning and optimization techniques for water quality management; (2) new or improved methods of data acquisition, transmission, processing and application; (3) innovation institutional arrangements for water quality management; and (4) techniques for evaluating the air pollution and solid waste effects of water pollution control. Emphasis will be on the socio-economic aspects. Program results will include reports, recommendations, demonstrations of practicality, and design criteria.

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1B1030

Research Objective Achievement Plan 06AFD: Systems Evaluation For Water Reuse and Conservation

Objective: Conduct economic and institutional research tasks with primarily extramural effort. Coordinate closely with Technology Division and Processes and Effects Division for engineering and health effects data.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
06AFD-02	Analyze regional economics of water reuse with special attention to misallocations due to non-competitive rate structures.	Research Grant	5	Ruff

Research Objective Achievement Plan 16ACB: Development of Improved Water Quality Planning Methodology

Objective: Assure that existing methodology is readily available in user-oriented formats and has been demonstrated by official planning authorities. Explore needed improvements in methodology with a combination of intra- and extramural effort.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
16ACB-04	Complete demonstration of comprehensive urban water quality planning model.	Demo Grant	5	Ruff
16ACB-06	Develop expanded model which considers multi-pollutants and capacity expansion scheduling.	Research Grant	5	Ruff

Research Objective Achievement Plan 16AFN: Evaluation of Alternative Approaches for Controlling Agricultural Pollution

Objective: Explore separable parts by extramural projects. Combine outputs from these tasks using intramural efforts. Main emphasis shall be on National economic and political aspects. Coordinate work with related efforts in Technology Division and Processes and Effects Division.

PROGRAM ELEMENT NO. 1B1030

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
16AFN-03	Develop systems analysis methodology for evaluating dispersed source agricultural wastes.	Contract	5	Ruff

Research Objective Achievement Plan 21AQJ: Economics of Water Quality

Objective: Develop methodology; develop benefit (damage-abatement) and cost-of-control functions; perform analysis of optimum strategies for pollution-control programs.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQJ-01	Development of methodology for economics of water pollution.	Contract	5	Ruff
21AQJ-02	Estimate pollution damages to marine industries.	Contract	5	Ruff
21AQJ-03	Estimate pollution damages to recreational water uses.	Contract	5	Ruff
21AQJ-04	Estimate cost-of-control functions for various water pollutants.	Contract	5	Ruff

Research Objective Achievement Plan 21AQT: Analysis of Water Quality And Effluent Standards

Objective: Analyze existing and alternative water quality and effluent standards from the view point of applicability, reliability, maintainability, economic efficiency and legal/administrative feasibility. Construct mathematical models where appropriate.

PROGRAM ELEMENT NO. 1B1030

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQT-01	Develop methodology for testing the effectiveness of existing water quality and effluent standards. Use the methodology to test the water quality standards of at least one region.	Contract	5	Ruff
21AQT-02	Evaluate the economic efficiency of water quality standards which gives least regional cost. Evaluate ambient quality implications of minimum discharge requirements, and associated economic impact.	Contract	5	Ruff
21AQT-03	Evaluate the air and land impact of water effluent and quality standards. Quantify the extent of the intermedia transfer of the residual disposal burdens caused by water standard.	Contract	5	Ruff
21AQT-04	Evaluate reliability achieved in meeting water quality standards, given the stochastic nature of effluent and hydrologic inputs. Investigate costs and benefits of various levels of reliability.	Research Grant	5	Ruff
21AQT-05	Analyze legal/administrative problems associated with water effluent and ambient quality standards. Evaluate informational requirements in enforcement of standards.	Contract	5	Ruff

PROGRAM ELEMENT NO. 1B1030

Research Objective Achievement Plan 21ARA: Impact of Water Resource Development

Objective: Social and economic benefits that have been realized from a project constructed some time ago will be compared with the benefits predicted before construction. A similar comparison will be made of actual environmental impact of the project and any predicted impacts. Predictions for future benefits of all types will then be made.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ARA-02	Perform case study.	Contract	5	Ruff

Research Objective Achievement Plan 51AQK: Development of Economic Incentive for Water Quality Control

Objective: Analyze success of current application, such as Vermont. Assess applicability of other media developments such as sulfur tax for air pollution. Propose and evaluate alternative methods, including necessary implementation resources.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
51AQK-02	Monitor and analyze success of existing effluent charge systems in U. S. and other countries.	Contract	5	Ruff
51AQK-03	Prepare array of permit fees and other charges which could accelerate accomplishing water goals, including the goal of "zero discharge".	Contract	5	Ruff

IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1D1312 – BEHAVIORAL RESEARCH

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Improved understanding of human behavior and of materials systems as they relate to the generation and disposal of solid waste, leading to strategies for reducing solid waste loads and for increasing resource recovery.

Program Element Manager (PEM):

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Program Element Director (PED):

Mr. Robert Stenburg
Solid Waste Research Division
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IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1D1315 – ECONOMIC BENEFIT ANALYSIS

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $ 100,000

Program Element Output: A quantitative estimate of the social benefits of solid waste management programs. Program efforts will be directed towards developing methodology for estimating the externalities associated with solid waste collection, recycling and disposal and with virgin materials use.

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1D1315

Research Objective Achievement Plan 24ACN: Estimate Benefits of Resource Recovery and Disposal Programs

Objective: Develop methodology for estimating the "externalities" associated with solid waste disposal, recycling, and collection, and with virgin materials use. Apply this methodology to particular cases to obtain quantitative estimates of the social benefits of solid waste management programs.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
24ACN-03	Estimate benefits of disposal programs.	Contract	208	Ruff
24ACN-04	Estimate benefits of reduced use of virgin materials.	Contract	208	Ruff

IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1H1091 – STANDARDS RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 15,000
Contracts: $ 150,000

Program Element Output: Recommendations leading to adoption of economically efficient and socially equitable standards for the protection and enhancement of environmental values. The standards sought will encompass a broad range of interconnected environmental problems involving ambient environmental quality condition, measurements, and evaluations, waste residuals production and disposal, plant location, land use and transportation controls, materials recycling, emissions data and accounting.

Program Element Manager (PEM):

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1H1091

Research Objective Achievement Plan 21ARG: Analysis of Environmental Standards

Objective: Analyze environmental standards from the standpoint of effectiveness, intermedia impact and economic efficiency. Specifically evaluate standards according to the following criteria: (1) **Applicability** — where and to what applied; (2) **Reliability** — statistical description of how well standards are met; (3) **Maintainability** — land-use standards to insure maintenance of ambient conditions in face of growth and increasing use of emission standards; (4) Intermedia Impact — transfer of residual disposal burden from one media to another because of standards, and (5) Economic Efficiency — extent to which standards approach the least-cost solution.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ARG-02	Evaluate the multimedia impact of environmental standards. Quantify the extent of intermedia transfer of residual disposal burden caused by environmental standards. Develop mechanism for comprehensive setting of standards.	Contract	Mixed	Gerhardt
21ARG-05	Estimate reliability achieved by environmental management systems in meeting standards. Describe inputs (effluent, emissions, etc.) to environmental statistically, transform into ambient conditions, and describe reliability with which standards are met.	Contract	Mixed	Gerhardt
21ARG-09	Evaluate impact of increasing number of sources of pollution, all of which may meet a performance (emission) standard, on ambient environmental quality. Investigate land-use planning as control option.	Research Grant	Mixed	Gerhardt

PROGRAM ELEMENT NO. 1H1091

Research Objective Achievement Plan 21ARH: Standards Implementation Studies

Objective: Through in-house and contract studies of practical operating problems of pollution control agencies including legislative, administrative, organizational, informational, and others. The research will draw on results of empirical and analytic studies and will emphasize comprehensive multimedia standards and regional problems.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ARH-03	Completion of detailed studies in accordance with priorities set in task and preparation of summary and recommendation reports for interval review and discussion.	Contract	Mixed	Gerhardt

IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1H1093 – SYSTEMS EVALUATION

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: NONE
Contracts: $ 160,000

Program Element Output: Expansion of the economic and systems analysis capacities of Environmental Protection Agency and Office of Research and Monitoring. This expanded capability will be used to evaluate, among other things: alternative environmental improvement strategies; the economic aspects of OR&M program choices; the interactions between the legal and economic systems in environmental matters; the system implications of pesticide use and control; and the effect on the socio-economic system of environmental policies concerning energy production and use.

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1H1093

Research Objective Achievement Plan 21AQK: Development of Economic Incentives for Environmental Improvement

Objective: Research shall be directed toward evaluating the use of economic incentives in achieving alternative levels of environmental quality. Alternative approaches for internalizing external costs will be reviewed and their impacts on the economic system will be estimated.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQK-04	Development of economic incentives to reduce mobile source air pollutant emissions.	Contract	Mixed	Ruff

Research Objective Achievement Plan 21AQL: Develop Economic and Social Systems Alternatives in Energy Sectors

Objective: To identify and develop a number of economical, realistic methods whereby energy consumption can be reduced or energy supply concepts changed, to reduce the adverse environmental consequences of energy use without radically affecting life styles or real incomes.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AQL-03	Development of methods for reducing peak energy demands.	Contract	Mixed	Ruff
21AQL-05	Development of "total energy" concept for commercial sectors.	Contract	Mixed	Ruff

IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1H1094 – ECONOMICS RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 204,000
Contracts: $ 140,000

Program Element Output: Economic information for use in environmental decision making. To accomplish this goal, the following functions are to be performed on a continuing basis: (1) provide Congress, EPA and the public comprehensive studies of the economic consequences of current or proposed pollution legislation; (2) evaluate and propose economic means of controlling pollution; (3) investigate the economic consequence of specific situations associated with pollution abatement; (4) conceptualize and assess, in economic terms, the benefits to be derived from pollution abatement; (5) conceptualize and assess in economic terms the direct and indirect costs of achieving pollution abatement; (6) provide economic information necessary in the development and implementation of pollution regulations; (7) investigate, explain, and predict the relationship of pollution abatement to environmental, social and economic goals.

Program Element Manager (PEM):

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1H1094

Research Objective Achievement Plan 01AAB: Environmental Costs-Benefit Methodology

Objective: Assess the current state-of-the-art in cost/benefit analyses, apply appropriate techniques to current areas of interest and modify or develop new techniques as necessary, compare results from alternative techniques and specify strengths and weakness, and identify areas where further development is required.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
01AAB-03	Define benefit-function interfaces with workable economic model.	Research Grant	Mixed	Abel
01AAB-05	Define cost-function interfaces with workable economic model.	Research Grant	Mixed	Abel

Research Objective Achievement Plan 07AAC: Quality Benefit Function

Objective: Begin with national point estimates of total damages for selected pollutants and receptors; extend these results into benefit (prevented damage) functions for all pollutants and receptors; incorporate into analysis of standards programs.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
07AAC-02	Establish total medical damages as result of air pollution.	Contract	Mixed	Abel
07AAC-03	Allocate health damages between mobile and stationary sources.	Contract	Mixed	Abel
07AAC-04	Estimate marine-industry damages due to water pollution.	Research Grant	Mixed	Abel
07AAC-05	Estimate health damages due to pesticides.	Research Grant	Mixed	Abel

PROGRAM ELEMENT NO. 1H1094

Research Objective Achievement Plan 10AEF: Environmental Cost-Benefit Analysis

Objective: Specify form of costs and benefit functions, and model of ambient environmental, so that direct economic effect of environmental programs can be estimated. Extend model to region and industrial details and extrapolate distributional affects to show net environmental benefits by population class.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
10AEF-03	Relationship of pollutant-contribution changes to ambient pollutant exposure changes.	Contract	Mixed	Abel
10AEF-04	Estimation of optimal control level for environmental protection programs.	Contract	Mixed	Abel

Research Objective Achievement Plan 10AMW: Environmental Quality Cost Functions

Objective: Begin with national estimates of costs of pollution control; add detail by considering least cost alternatives for each industry; construct cost functions by industry and pollution level; reaggregate to form industrial and national totals.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
10AMW-05	Cost functions by industry for varied levels of abatement for each pollutant.	Contract	Mixed	Abel

IMPLEMENTATION RESEARCH PROGRAM AREA

PROGRAM ELEMENT NO. 1H1095 – ECOLOGICAL IMPACT

Funds: No extramural Tasks remaining which are planned for funding in current Fiscal Year.

Program Element Output: Evaluation of the broader questions of environmental impact without regard to medium or category. Office of Research and Monitoring will expand its research in this area by: (1) carrying out research that will help EPA to make comments on environmental impact statements prepared by other Federal agencies; (2) investigating aspects of environmental quality not adequately considered in present environmental impact analyses; (3) developing measures of these and other aspects of environmental quality so as to determine change over time; and (4) investigating the underlying causes of environmental problems.

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Program Element Director (PED):

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ENVIRONMENTAL STUDIES PROGRAM AREA

Research in this area explores and develops strategies and mechanisms for local and regional use in environmental management. This exploration involves the evaluation of institutional forms, modeling techniques and methodologies that are comprehensive in scope.

The institutions dealt with include those in the economic, social, governmental and environmental systems. The holistic approach taken toward the study of these systems insures that the total effects of environmental policy are considered. The basic system forces influencing growth, change and operation are analyzed to see how they might be affected so as to bring about desirable environmental consequences. Furthermore, the institutional feasibility of various policy alternatives and technological changes are investigated so as to reveal the types of social, political and economic resistance likely to arise in response to innovations in policy making and technology. In association with this management orientation, comprehensive planning tools and models are developed with the user in mind and will be readily modifiable to fit circumstances in different local areas.

Prototype centers are established to test the feasibility of alternative approaches for disseminating information at the regional scale among interest groups including federal government, university departments and local government agencies. The ultimate intent is to develop a prototype center for the analysis and management of the full range of regional and national environmental problems. Such a center would assess the implications of environmental policy alternatives so as to facilitate the most satisfactory balance among the various contributing factors.

Other objectives in this area are to: (1) assess the present state of planning and land use; (2) identify land use patterns which cause the least pollution; (3) determine environmental concerns; and (4)develop methods by which goals can be achieved.

ENVIRONMENTAL STUDIES PROGRAM AREA

PROGRAM ELEMENT NO. 1H1096 – ECOSYSTEM RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 750,000
Contracts: $ 437,000

Program Element Output: Development of an improved understanding of the relationship between environmental problems and the totality of society, including its environmental, social, economic and institutional systems; and the means by which environmental policy and technology can be designed to conform with and effectively utilize these systems. Program emphasis will be given to understanding the basic forms of growth and change in urban and regional systems; developing and evaluating comprehensive models for the assessment of the impact of environmental policy decisions; and identifying institutional forms which might be channeled to achieve environmental quality goals.

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1H1096

Research Objective Achievement Plan 21ALV: Modeling and Methodologies Development

Objective: Survey and evaluate the state-of-the-art of urban and regional computer-based models that deal with one or more of the following sub-systems: environmental pollution, land use, transportation, migration, public finance, public services, population activity systems, demography, and others. Further, to build upon this base of models and develop a set of decision-making models that are useful in determining the holistic impact of environmental management policies.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALV-09	Development of Environmental Systems Laboratory capable of producing a broad systems approach to environmental problems, specifically in areas of social-environmental-technological interface.	Research Grant	Mixed	House
21ALV-10	Survey and review of existing long range planning and forecasting techniques.	Research Grant	Mixed	House
21ALV-11	Model interaction with European researchers. Ties will be made with European researchers, model builders, and model users in an effort to exchange research findings and models that might prove transferable.	Contract	Mixed	House
21ALV-12	Forecasting the Major Societal and Technological Events. Procedures for forecasting the probability of certain major events occuring will be developed and tested with the assistance of a panel of experts.	Research Grant	Mixed	House

PROGRAM ELEMENT NO. 1H1096

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALV-13	Develop liaison with local government officials and their computer support staffs. Local government environmental managers and model users will be queried to determine what types of models they are able to use and what types of models they most prefer and need.	Contract	Mixed	House
21ALV-14	Projection of National and Regional Economic and Demographic Information. Procedures will be assembled, and modified where necessary, to project economic and demographic data that affect environmental problem creation and solution for the Nation and for regional areas.	Research Grant	Mixed	House
21ALV-15	Projection of Natural Resource Utilization. Mechanisms will be designed and developed to project the utilization of natural renewable and non-renewable resources on a national and regional basis. Resources such as fuels, minerals, animals, etc. will be included.	Contract	Mixed	House

PROGRAM ELEMENT NO. 1H1096

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALV-16	Models of Waste Generation. Models will be developed that can relate the amount of waste generation (into all of the media) to the population size and mix industrial processes, consumption forms, recycling technology, incentive systems and other relevant factors	Research Grant	Mixed	House
21ALV-17	Operationalize Components of a General Environmental Model. Complete the synthesizing, design, programming, and testing of various components of a general environmental model. This would include such components as internal and external population flows, transportation (work and non-work related), and others.	Contract	Mixed	House
21ALV-18	Develop Data Base for Environmental Models. Make operational the most efficient methods of developing data for environmental models from existing sources and, when necessary, from newly created sources.	Contract	Mixed	House
21ALV-19	Provision of General Computer Support. Assure the needed access to systems analysts, computer operators, and programming assistance for the ongoing model building and testing operations of the Division.	Contract	Mixed	House

PROGRAM ELEMENT NO. 1H1096

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21ALV-20	Development of Ecosystem Models. Design and develop models that relate a number of ecosystem factors together in a way that highlights the impact of environmental management decisions on the ecological system.	Research Grant	Mixed	House

ENVIRONMENTAL STUDIES PROGRAM AREA

PROGRAM ELEMENT NO. 1H1097 – ENVIRONMENTAL MANAGEMENT RESEARCH

Funds: Available as of October 6, 1972 for support of listed Tasks:

Grants:	\$ 800,000
Contracts:	\$ 300,000

Program Element Output: Development of an interactive network of Environmental Studies Centers which provide the technical and institutional capability for evaluating the comprehensive and long-range impact of alternative policy decisions. Emphasis will be given to use and dissemination of decision-making methodology including comprehensive models.

Program Element Manager (PEM):

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1H1097

Research Objective Achievement Plan 21AKN: Environmental Studies Centers

Objective: Support the development of environmental studies centers in selected regions which can then be modified and implemented in other areas throughout the Country. Centers will be capable of producing a broad systems approach to environmental management.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKN-09	National Environmental Management Conference to analyze, evaluate and plan regional strategies for environmental management.	Contract	Mixed	House
21AKN-10	To investigate, collate and tabulate national land-use and energy stocks for the purpose of tracking potential depletion of scarce and/or non-replaceable resources.	Contract	Mixed	House
21AKN-11	To examine, study and test a regional environmental management methodology in a large River Basin Area. The project will utilize a multi-media and multi-jurisdictional approach.	Research Grant	Mixed	House
21AKN-12	To develop and test an estuarine environmental management methodology by utilizing simulation and other techniques.	Research Grant	Mixed	House

PROGRAM ELEMENT NO. 1H1097

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKN-13	To design and develop a methodology for environmental management at the Federal Regional level.	Research Grant	Mixed	House
21AKN-14	To provide support for a follow-on effort to enable the San Diego **IREM** Project to expand its concern to encompass a broader range of considerations, such as water quality.	Research Grant	Mixed	House
21AKN-15	To support the development of several Environmental Information Centers which will serve as repositories and *foci* of environmental data and information.	Research Grant	Mixed	House

ENVIRONMENTAL STUDIES PROGRAM AREA

PROGRAM ELEMENT NO. 1H1098 – ENVIRONMENTAL FORECASTING

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: $ 359,000
Contracts: $ 175,000

Program Element Output: Development of effective means for defining future environmental conditions, relating these futures to existing conditions and trends and defining alternative means for achieving these futures. By using these tools the environmental policy-maker will be able to assess more effectively the long-term consequences of his decisions and to adjust continually his policy in order to achieve the desired set of future conditions. Program emphasis will be given to developing reliable quality of life indicators; defining alternative paths to reach desired futures; identifying new forms of pollution; and developing an "early warning" system for identifying potential environmental problems.

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Program Element Director (PED):

Same as PEM

PROGRAM ELEMENT NO. 1H1098

Research Objective Achievement Plan 21AKL: Comprehensive Planning

Objective: Identify the various urban system, activities, land use, human interpretations and other elements which affect social, environmental and ecological aspects of life. Identify and describe the nature of the relationships between various pollutants and their impact. Review the nature of the urban planning and development control systems with particular attention to the rule of environmental quality goals. Suggest promising modifications to the organizational, methodological, legal and other dimensions of the planning and control systems. Survey and review existing long range planning and forecasting techniques. Evaluate contributions that may be derived from these techniques for planning and forecasting in general and their applicability to the analysis of environmental problems in particular.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKL-06	Compare and contrast ideal forms of governmental organizations for dealing with environmental pollution with existing approaches. Suggest changes that could be encouraged over the near and long term.	Research Grant	Mixed	House
21AKL-07	Data Availability for **QOL** Vector. This project will be aimed at gathering data to support the **QOL** Vector defined at the **QOL** Conference.	Contract	Mixed	House
21AKL-08	Natural Environmental Constraints to Planning. This will be a feasibility study which is expected to serve as a basis for a larger study that examines the regional differences in natural environmental characteristics and the consideration they should be given in land use planning for environmental quality.	Contract	Mixed	House

PROGRAM ELEMENT NO. 1H1098

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKL-09	Limited Resources Study. This project will study a restricted land area and investigate how limited resources are considered in making land use decisions. Emphasis will be placed on the framework and methodology that decision makers need to make the necessary trade-offs in future decisions related to land development.	Research Grant	Mixed	House
21AKL-10	Aesthetics in Urban Planning. The role of aesthetics in environmental quality and in the individual's daily life experience is becoming increasingly important. Methodology is needed for decision makers and planners to incorporate the importance of aesthetic and cultural trade-offs into policy and planning decision making. This study will define appropriate measures of perceptual and emotional responses of population groups into various qualitative aspects (primarily visual) of the environment that satisfy needs of people beyond absolute necessities of life.	Research Grant	Mixed	House
21AKL-12	Testing **QOL** Vector in Cities. This project will take the **QOL** Vector defined at the **QOL** Conference and test it in real cities.	Contract	Mixed	House

PROGRAM ELEMENT NO. 1H1098

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
21AKL-13	Natural Environmental Constraints to Planning. This project will utilize the results of the feasibility study on this topic and pursue a study which will examine the regional differences in natural environmental characteristics. This will be done to develop an output which will guide the consideration of these characteristic differences in land use planning for environmental quality.	Contract	Mixed	House
21AKL-14	Test Land Use Decision Methodologies at State and Local Levels. This project will gather existing and proposed land use control mechanisms and other techniques, methodologies and institutional arrangements for making environmentally sensitive land use decisions.	Research Grant	Mixed	House
21AKL-15	Elemental Causes of Solid Wastes. This study will take a fresh and comprehensive approach to the solid waste problem by focusing on urban litter with special reference to the highly impacted center city environment. Through long-term trend analysis the behavioral, technical and institutional aspects of the problem will be addressed.	Research Grant	Mixed	House

MONITORING PROGRAM AREA

The Office of Monitoring has over-all responsibility for the establishment of procedures for the acquisition and analysis of monitoring data. The quality control program assures that these data are technically feasible, accurate, and compatible with the overall objectives of EPA. Guidelines to assure a systematic approach to the definition of environmental quality are established for use by local, State, and regional offices. All new or improved methods and advanced research techniques in the area of monitoring will be tested for possible implementation.

More specifically, efforts to meet EPA objectives in the area of monitoring activities include:

(1) Program planning and review to assure technical feasibility; coordination, review and recommendation on all budgetary and planning actions; development of long-range, multimedia strategies; design and implementation of programs for auditing and improving the acquisition, processing and utilization of data; development and review of over-all environmental indices involving multimedia and multicategorical approaches related to health and welfare effects; analysis of multimedia data and special studies; development of requirements for research and monitoring programs.

(2) Development and implementation of an Agencywide standardization and quality control program to assure that environmental data produced by Federal, State and local agencies are compatible, accurate and legally defensible; coordination and publication of procedures and methods for sampling and analyzing environmental pollutants and reporting data; establishment of procedures for the determination of acceptability of methods and instruments for field use; development, implementation and direction of the Agencywide quality control program for environmental monitoring; preparation and coordination of guidelines for use by local, State and regional offices in the area of quality control for a systematic approach to the definition of environmental quality; evaluation of presently used monitoring techniques and recommendations of any changes which should be implemented; establishment of procedures for the determination of acceptability of methods and instruments for field use; participation in international standardization and quality control activities.

(3) Coordination and direction of all tests of new or improved techniques, including advanced sensor research, which have potential application to improving the over-all effectiveness of environmental monitoring; operation of monitoring networks as required to support certain research objectives; integration and support of the EPA research laboratory monitoring activities to meet Regional Office and Headquarters objectives.

MONITORING PROGRAM AREA

PROGRAM ELEMENT NO. 1B1029 – LAKE SURVEY

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Identification of those lakes and other impounded bodies of water which receive effluent discharges from municipal sewage treatment plants. Following this identification, samples will be collected from selected lakes for an evaluation of the response of the receiving water to reductions in phosphorus discharge from treatment plants.

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MONITORING PROGRAM AREA

PROGRAM ELEMENT NO. 1H1325 – MONITORING PLANNING & REVIEW

Funds: No extramural Tasks remaining which are planned for funding in the current Fiscal Year.

Program Element Output: Assurance of the technical feasibility of planned monitoring activities by coordinating, reviewing and concurring in all budgetary and planning actions involving monitoring. Program efforts will also relate to developing and refining long-range monitoring strategies and objectives, and to designing and implementing programs for auditing and improving the acquisition, processing and utilization of monitoring data. Additional objectives include development and review of environmental indices and participation in appropriate national and international monitoring activities.

Program Element Manager (PEM):

Mr. H. Matthew Bills
Planning and Review Division
Environmental Protection Agency
Waterside Mall
Washington, DC 20460
Telephone: (202) 755–0468

Program Element Director (PED):

Selection of PED is pending.

MONITORING PROGRAM AREA

PROGRAM ELEMENT NO. 1H1326 – ADVANCED MONITORING TECHNIQUES

Funds: No extramural Tasks remaining which are planned for funding
in the current Fiscal Year.

Program Element Output: Testing and evaluation of techniques and analytical methodology for advanced remote sensing and *in situ* sensing of environmental parameters. As new technology is developed for sensing environmental pollutants or their effects, plans and programs to test and evaluate capabilities and assess proper techniques for operational implementation will be developed and evaluated to ensure that acquired sensor data are compatible with and of suitable quality for analyses. Monitoring networks will be operated to assure technical and operational support for the Regions, Office of Research and Monitoring, Office of Enforcement and General Counsel and Office of Air and Water Programs.

Program Element Manager (PEM):

Mr. Donald C. Holmes
Advanced Techniques Division
Environmental Protection Agency
Waterside Mall
Washington, DC 20460
Telephone: (202) 755–2572

Program Element Director (PED):

Selection of PED is pending.

MONITORING PROGRAM AREA

PROGRAM ELEMENT NO. 1H1327 – MONITORING QUALITY ASSURANCE

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grants: None
Contracts: $ 500,000

Program Element Output: Development and implementation of an Agencywide standardization and quality control program to assure that environmental data produced by Federal, State and local agencies are compatible, accurate and legally defensible. Program effort will be to select, evaluate, standardize and publish procedures and methods for sampling, analyzing and reporting data relative to environmental pollutants. In addition this program will establish procedures for and determine the acceptability and equivalancy of methods and instruments for field use.

Program Element Manager (PEM):

Mr. George B. Morgan
Quality Assurance Division
Environmental Protection Agency
Waterside Mall
Washington, DC 20460
Telephone: (202) 755–0468

Program Element Director (PED):

Selection of PED is pending.

PROGRAM ELEMENT NO. 1H1327

Research Objective Achievement Plan 22ABB: Development and Implementation of Quality Control Program-Air

Objective: Develop guidelines, procedures, materials and systems to insure intralaboratory and interlaboratory quality control. Implement, coordinate, evaluate and provide technical assistance to quality control programs of EPA Regional Laboratories, National Environmental Research Centers and State and local laboratories.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
22ABB-02	Develop guidelines and procedures for intralaboratory quality control of pollutant measurements.	Contract	Mixed	Morgan
22ABB-04	Develop and procure test materials for use in intralaboratory and interlaboratory quality control activities.	Contract	Mixed	Morgan

Research Objective Achievement Plan 26AAF: Generation of Approved Analytical Methods in Ambient Air

Objective: The approach is to evaluate and standardize the analytical methods given in the National Ambient Air Quality Standards which have been promulgated or which seem likely to be promulgated.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26AAF-07	Collaboratively test NO_2 sampling and measurement method for ambient air.	Contract	Mixed	Morgan
26AAF-09	Collaboratively test hydrocarbon sampling and analysis methods for ambient air.	Contract	Mixed	Morgan

PROGRAM ELEMENT NO. 1H1327

Research Objective Achievement Plan 26ADE: Standardization of Methods for Measuring Emissions from Light Duty Vehicles

Objective: The approach is to evaluate and standardize the test methods given in the Exhaust Emission Standards and Test Procedures due for promulgation.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26ADE-02	Standardize test methods for measurement of emissions of CO, HC and NO_x from light duty vehicles.	Contract	Mixed	Morgan

Research Objective Achievement Plan 26ADZ: Development of Standard Reference Materials (SRM) for Ambient Air Mobile and Stationary Sources

Objective: The approach is to develop prototype Standard Reference Materials (SRM's) and then through a research and development program. The SRM's will be used to standardize analytical methods.

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26ADZ-02	Develop SRM's for hydrocarbon measurements in ambient air.	Contract	Mixed	Morgan
26ADZ-05	Develop an SRM for lead measurements in particulate matter from ambient air.	Contract	Mixed	Morgan
26ADZ-11	Develop an SRM for CO measurements in stationary source emissions.	Contract	Mixed	Morgan

PROGRAM ELEMENT NO. 1H1327

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
26ADZ-12	Develop an SRM for H_2S measurements in stationary source emissions.	Contract	Mixed	Morgan
26ADZ-16	Develop an SRM for NO measurements in mobile source emissions.	Contract	Mixed	Morgan
26ADZ-17	Develop an SRM for CO_2 measurements in mobile source emissions.	Contract	Mixed	Morgan

MINORITY INSTUTIONS RESEARCH SUPPORT PROGRAM AREA

Assistance to minority institutions in utilizing their environmental research capability to participate in EPA research activities.

PROGRAM ELEMENT NO. 1H1323 – MINORITY INSTITUTIONS RESEARCH SUPPORT

Funds: Available as of October 6, 1972 for support of listed Tasks:
Grant: $ 440,000
Contract: None

Program Element Output: Assistance to minority institutions in utilizing their environmental research capability to participate in EPA research activities. Program efforts will be directed to: (1) identify research capabilities within minority institutions, and (2) award research grants in a manner which will support the research needs of OR&M and enhance the research capabilities of the institutions.

Program Element Manager (PEM):

Dr. Willie Ashley, Jr.
Minority Institutions Research Support
Environmental Protection Agency
1750 K Street, N.W.
Washington, DC 20460
Telephone: (202) 254–7572

Program Element Director (PED):

Same as PEM

Task No.	Task Description	Expected Funding Mechanism	Auth. Leg.	Cognizant PEM/PED
PEMP-02	Award research grants to minority institutions, in a manner which will support achievement of OR&M's research objectives and which will assist these institutions in expanding their environmental research capability.	Research Grant	Mixed	Ashley

APPENDIX A

EXTRAMURAL PROGRAM AUTHORIZING LEGISLATION

This Appendix is keyed to the authorizing legislation code shown in PART II for each Task listed. These codes are listed in this Appendix in numerical order.

Auth. Leg. Code

5

Statutory authority: Section 5, Federal Water Pollution Control Act, (P.L. 84–660), as amended - 33 U.S.C. 1155.

Purpose: To support and promote the coordination of research, development and demonstration projects relating to the causes, control and prevention of water pollution.

Eligible grantees: Public or private agencies and institutions and individuals.

Funding limitations: Grants may not exceed 95 percent of the estimated total eligible cost of the project.

Other limitations: None

6 (a) (1)

Statutory authority: Section 6 (a) (1), Federal Water Pollution Control Act (P.L. 84–660), as amended --- 33 U.S.C. 1156.

Purpose: To assist in the development of projects to demonstrate new or improved methods of controlling the discharge of untreated or inadequately treated wastes from storm or combined sewers.

Eligible grantees: States, municipalities or intermunicipal or interstate agencies.

Funding limitations: Grants may not exceed 75 percent of the estimated total eligible cost of the project.

Other limitations: Proposed projects must have been approved by the appropriate State water pollution control agency or agencies.

APPENDIX A

Auth. Leg. Code

6 (a) (2)

Statutory authority: Section 6 (a) (2), Federal Water Pollution Control Act (P.L. 84–660), as amended --- 33 U.S.C. 1156.

Purpose: To assist in the development of projects to demonstrate advanced waste treatment and wastewater renovation methods or new or improved joint treatment systems for municipal and industrial wastes.

Eligible grantees: States, municipalities, or intermunicipal or interstate agencies.

Funding limitations: Grants may not exceed 75 percent of the estimated total eligible cost of the project.

Other limitations: Proposed projects must have been approved by the appropriate State water pollution control agency or agencies.

6 (b)

Statutory authority: Section 6 (b), Federal Water Pollution Control Act (P.L. 84–660), as amended --- 33 U.S.C. 1156.

Purpose: To support research and demonstration projects for prevention of pollution by industry including, but not limited to, treatment of industrial waste.

Eligible grantees: Individuals, partnerships or corporations, public or private, or other legally accountable institutions or agencies.

Funding limitations: Grants may not exceed 70 percent of the estimated total eligible cost of the project or $1,000,000, whichever is less.

Other limitations: Proposed projects must serve a useful purpose in the development or demonstration of a new or improved method of treating industrial wastes or otherwise preventing industrial pollution and must have industrywide application.

APPENDIX A

Auth. Leg. Code

14

Statutory authority: Section 14, Federal Water Pollution Control Act (P.L. 84–660), as amended --- 33 U.S.C. 1164.

Purpose: To support projects to demonstrate methods for the elimination or control of acid or other mine water pollution resulting from active or abandoned mines.

Eligible grantees: States or interstate agencies.

Funding limitations: Grants may not exceed 75 percent of actual project costs and no more than 25 percent of the total funds available in this section in any one year may be granted to any one State.

Other limitations: Proposed projects must demonstrate the engineering and economic feasibility and practicality of various abatement techniques which will contribute substantially to effective and practical methods of acid or other mine water pollution elimination or control; also, the grantee must provide legal and practical protection to the project area to insure against any activities which will cause future acid or other mine water pollution.

20

Statutory authority: Section 20,Federal Water Pollution Control Act (P.L. 84–660), as amended --- 33 U.S.C. 11.

Purpose: To carry out projects to demonstrate methods to provide for central community facilities for safe water and elimination or control of water pollution in those native villages of Alaska without such facilities.

Eligible grantees: The State of Alaska.

Funding limitations: Grants may not exceed 95 percent of the estimated total eligible cost of the project.

Other limitations: Projects must include provisions for community safe water supply systems, toilets, bathing and laundry facilities, sewage disposal facilities and other similar facilities and educational and informational facilities and programs relating to health and hygiene.

APPENDIX A

Auth. Leg. Code

103 Statutory authority: Section 103, Clear Air Act (P.L. 88–206), as amended --- 42 U.S.C. 1857 b.

Purpose: To support and promote the coordination of research, development and demonstration projects relating to the causes, effects, extent, prevention and control of air pollution.

Eligible grantees: Air pollution control agencies, other public or non-profit private agencies, institutions and organizations and individuals.

Funding limitations: Grants may not exceed 95 percent of the estimated total eligible cost of the project.

Other limitations: None

104 Statutory authority: Section 104, Clean Air Act (P.L. 88–206), as amended --- 42 U.S.C. 1857 b-1.

Purpose: To support research and development projects on new and improved methods having industrywide application for the prevention and control of air pollution resulting from the combustion of fuel.

Eligible grantees: Public or non-profit agencies, institutions and organizations and individuals.

Funding limitations: Grants may not exceed 95 percent of the estimated total eligible cost of the project or $1,500,000, whichever is less.

Other limitations: None

204 Statutory authority: Section 204, Solid Waste Disposal Act (P.L. 89–272), as amended --- 42 U.S.C. 3253.

APPENDIX A

Auth. Leg. Code

204 **Purpose:** To support and promote the coordination of research, development and demonstration projects relating to any adverse health and welfare effects of the release into the environment of material present in solid waste and methods to eliminate such effects, the operation and financing of solid waste disposal programs, the reduction of the amount of such waste and unsalvageable waste materials, the development and application of new and improved methods of collecting and disposing of solid waste and processing and recovering materials and energy from solid waste, and the identification of solid waste components and potential materials and energy recoverable from waste components.

Eligible grantees: Public or private agencies and institutions and individuals.

Funding limitations: Grants may not exceed 95 percent of the estimated total eligible cost of the project.

Other limitations: All information, uses, processes, patents and other developments resulting from these projects will be made readily available on fair and equitable terms to industries utilizing methods of solid waste disposal and industries engaging in furnishing devices, facilities, equipment and supplies to be used in connection with solid waste disposal.

205 Statutory authority: Section 205, Solid Waste Disposal Act (P.L. 89—272), as amended --- 42 U.S.C. 3253.

Purpose: To investigate, study and demonstrate means of recovering materials and energy from solid waste, recommended uses of such materials and energy, changes in current product characteristics and production and packaging practices which would reduce the amount of solid waste, methods of collection, separation and containerization, the use of Federal procurement to develop market demand for recovered resources, recommended incentives and disincentives to accelerate the reclamation or recycling and reuse of materials and the likely effect of the modification or elimination of such incentives and disincentives and the necessity and method of imposing disposal and other changes on packaging, containers, vehicles and other manufactured goods.

APPENDIX A

Auth. Leg. Code

205 Eligible grantees: Public or private agencies and institutions and individuals.

Funding limitations: Grants may not exceed 95 percent of the estimated total eligible cost of the project.

Other limitations: All information, uses, processes, patents and other developments resulting from these projects will be made readily available on fair and equitable terms to industries utilizing methods of solid waste disposal and industries engaging in furnishing devices, facilities, equipment and supplies to be used in connection with solid waste disposal.

301 Statutory authority: Section 301, Public Health Service Act (P.L. 78–410), as amended --- 42 U.S.C. 241.

Purpose: To support and promote the coordination of research projects relating to human and ecological effects from pesticides, pesticide degradation products and alternatives to pesticide and determination of the extent and character of radiation problems, mechanisms of radiation damage in humans, improvements in techniques for assessing the effects of radiation and radiation dose-disease relationship.

Eligible grantees: Universities, hospitals, laboratories and other public or private institutions or individuals.

Funding limitations: Grants may not exceed 95 percent of the estimated total eligible cost of the project.

Other limitations: All grants must be recommended by the National Advisory Health Council.

Mixed Statutory authority and other requirements can be **any** of the listed laws depending upon the specific purpose of the Program Element and Task.

FIGURE B1

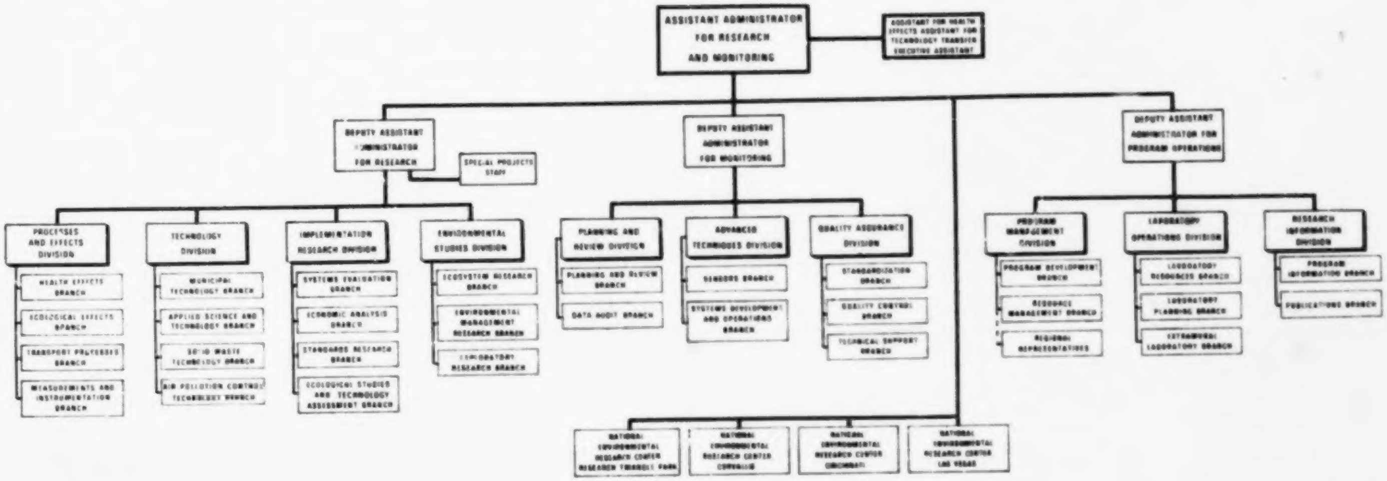

ASSISTANT ADMINISTRATOR FOR RESEARCH AND MONITORING
ASSISTANT FOR HEALTH EFFECTS ASSISTANT FOR TECHNOLOGY TRANSFER EXECUTIVE ASSISTANT
DEPUTY ASSISTANT ADMINISTRATOR FOR RESEARCH
SPECIAL PROJECTS STAFF
PROCESSES AND EFFECTS DIVISION
HEALTH EFFECTS BRANCH
ECOLOGICAL EFFECTS BRANCH
TRANSPORT PROCESSES BRANCH
MEASUREMENTS AND INSTRUMENTATION BRANCH
TECHNOLOGY DIVISION
MUNICIPAL TECHNOLOGY BRANCH
APPLIED SCIENCE AND TECHNOLOGY BRANCH
SOLID WASTE TECHNOLOGY BRANCH
AIR POLLUTION CONTROL TECHNOLOGY BRANCH
IMPLEMENTATION RESEARCH DIVISION
SYSTEMS EVALUATION BRANCH
ECONOMIC ANALYSIS BRANCH
STANDARDS RESEARCH BRANCH
ECOLOGICAL STUDIES AND TECHNOLOGY ASSESSMENT BRANCH
ENVIRONMENTAL STUDIES DIVISION
ECOSYSTEM RESEARCH BRANCH
ENVIRONMENTAL MANAGEMENT RESEARCH BRANCH
EXPLORATORY RESEARCH BRANCH
DEPUTY ASSISTANT ADMINISTRATOR FOR MONITORING
PLANNING AND REVIEW DIVISION
PLANNING AND REVIEW BRANCH
DATA AUDIT BRANCH
ADVANCED TECHNIQUES DIVISION
SENSORS BRANCH
SYSTEMS DEVELOPMENT AND OPERATIONS BRANCH
QUALITY ASSURANCE DIVISION
STANDARDIZATION BRANCH
QUALITY CONTROL BRANCH
TECHNICAL SUPPORT BRANCH
DEPUTY ASSISTANT ADMINISTRATOR FOR PROGRAM OPERATIONS
PROGRAM MANAGEMENT DIVISION
PROGRAM DEVELOPMENT BRANCH
RESOURCE MANAGEMENT BRANCH
REGIONAL REPRESENTATIVES
LABORATORY OPERATIONS DIVISION
LABORATORY RESOURCES BRANCH
LABORATORY PLANNING BRANCH
EXTRAMURAL LABORATORY BRANCH
RESEARCH INFORMATION DIVISION
PROGRAM INFORMATION BRANCH
PUBLICATIONS BRANCH
NATIONAL ENVIRONMENTAL RESEARCH CENTER RESEARCH TRIANGLE PARK
NATIONAL ENVIRONMENTAL RESEARCH CENTER CORVALLIS
NATIONAL ENVIRONMENTAL RESEARCH CENTER CINCINNATI
NATIONAL ENVIRONMENTAL RESEARCH CENTER LAS VEGAS

FIGURE B-2

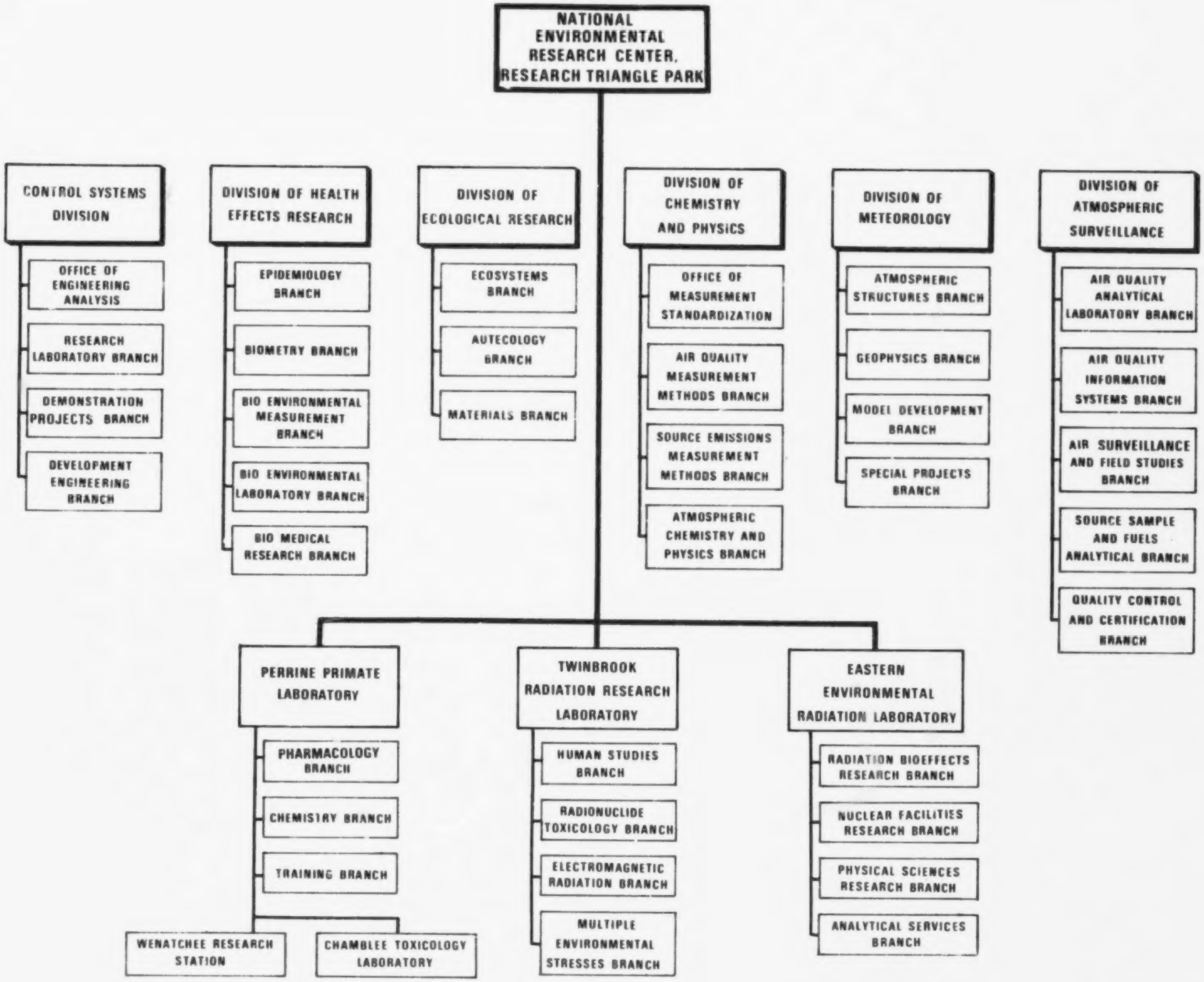

NATIONAL ENVIRONMENTAL RESEARCH CENTER, RESEARCH TRIANGLE PARK
CONTROL SYSTEMS DIVISION
OFFICE OF ENGINEERING ANALYSIS
RESEARCH LABORATORY BRANCH
DEMONSTRATION PROJECTS BRANCH
DEVELOPMENT ENGINEERING BRANCH
DIVISION OF HEALTH EFFECTS RESEARCH
EPIDEMIOLOGY BRANCH
BIOMETRY BRANCH
BIO ENVIRONMENTAL MEASUREMENT BRANCH
BIO ENVIRONMENTAL LABORATORY BRANCH
BIO MEDICAL RESEARCH BRANCH
DIVISION OF ECOLOGICAL RESEARCH
ECOSYSTEMS BRANCH
AUTECOLOGY BRANCH
MATERIALS BRANCH
DIVISION OF CHEMISTRY AND PHYSICS
OFFICE OF MEASUREMENT STANDARDIZATION
AIR QUALITY MEASUREMENT METHODS BRANCH
SOURCE EMISSIONS MEASUREMENT METHODS BRANCH
ATMOSPHERIC CHEMISTRY AND PHYSICS BRANCH
DIVISION OF METEOROLOGY
ATMOSPHERIC STRUCTURES BRANCH
GEOPHYSICS BRANCH
MODEL DEVELOPMENT BRANCH
SPECIAL PROJECTS BRANCH
DIVISION OF ATMOSPHERIC SURVEILLANCE
AIR QUALITY ANALYTICAL LABORATORY BRANCH
AIR QUALITY INFORMATION SYSTEMS BRANCH
AIR SURVEILLANCE AND FIELD STUDIES BRANCH
SOURCE SAMPLE AND FUELS ANALYTICAL BRANCH
QUALITY CONTROL AND CERTIFICATION BRANCH
PERRINE PRIMATE LABORATORY
PHARMACOLOGY BRANCH
CHEMISTRY BRANCH
TRAINING BRANCH
WENATCHEE RESEARCH STATION
CHAMBLEE TOXICOLOGY LABORATORY
TWINBROOK RADIATION RESEARCH LABORATORY
HUMAN STUDIES BRANCH
RADIONUCLIDE TOXICOLOGY BRANCH
ELECTROMAGNETIC RADIATION BRANCH
MULTIPLE ENVIRONMENTAL STRESSES BRANCH
EASTERN ENVIRONMENTAL RADIATION LABORATORY
RADIATION BIOEFFECTS RESEARCH BRANCH
NUCLEAR FACILITIES RESEARCH BRANCH
PHYSICAL SCIENCES RESEARCH BRANCH
ANALYTICAL SERVICES BRANCH

FIGURE B-3

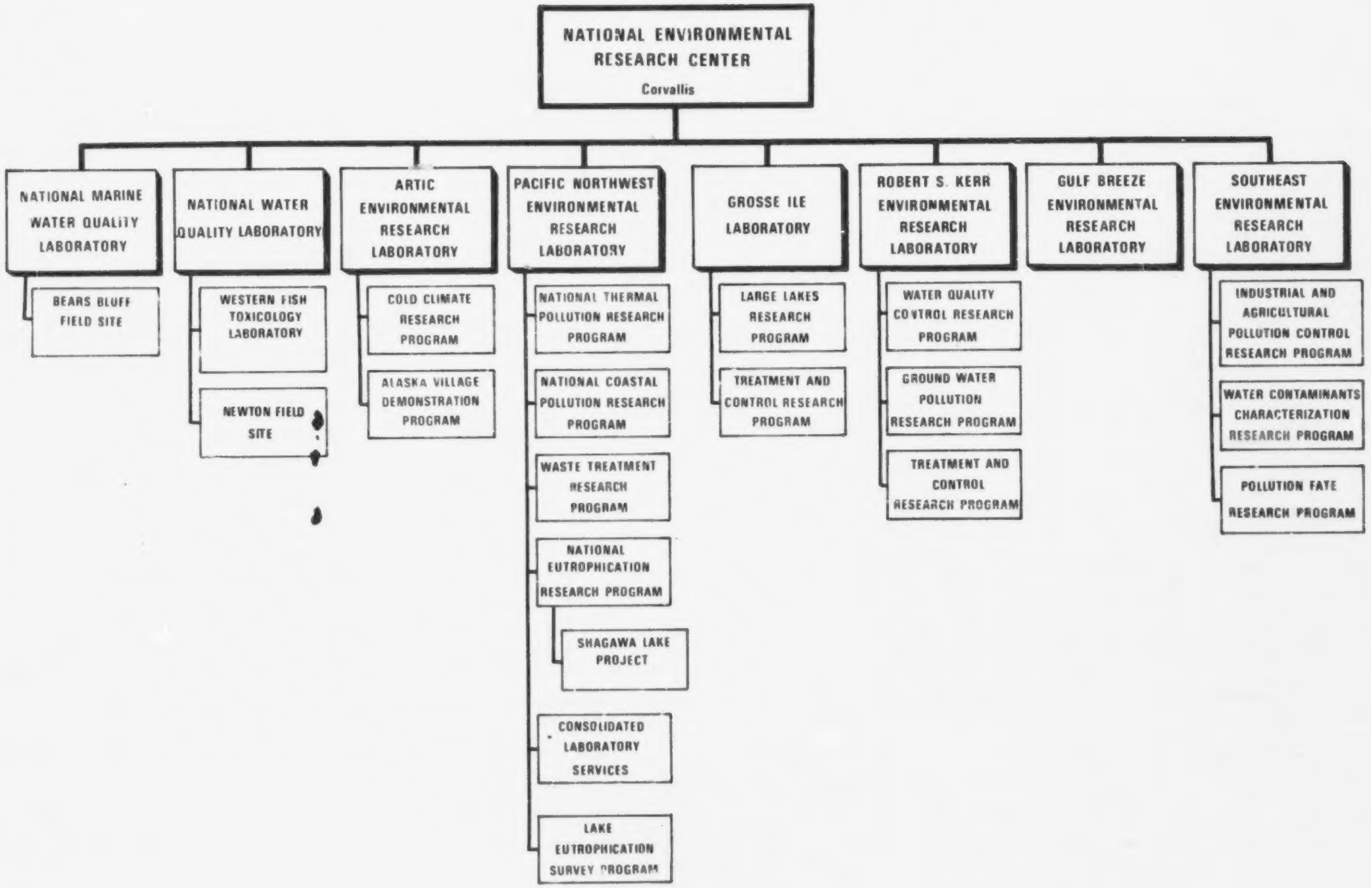

NATIONAL ENVIRONMENTAL RESEARCH CENTER
Corvallis
NATIONAL MARINE WATER QUALITY LABORATORY
BEARS BLUFF FIELD SITE
NATIONAL WATER QUALITY LABORATORY
WESTERN FISH TOXICOLOGY LABORATORY
NEWTON FIELD SITE
ARTIC ENVIRONMENTAL RESEARCH LABORATORY
COLD CLIMATE RESEARCH PROGRAM
ALASKA VILLAGE DEMONSTRATION PROGRAM
PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LABORATORY
NATIONAL THERMAL POLLUTION RESEARCH PROGRAM
NATIONAL COASTAL POLLUTION RESEARCH PROGRAM
WASTE TREATMENT RESEARCH PROGRAM
NATIONAL EUTROPHICATION RESEARCH PROGRAM
SHAGAWA LAKE PROJECT
CONSOLIDATED LABORATORY SERVICES
LAKE EUTROPHICATION SURVEY PROGRAM
GROSSE ILE LABORATORY
LARGE LAKES RESEARCH PROGRAM
TREATMENT AND CONTROL RESEARCH PROGRAM
ROBERT S. KERR ENVIRONMENTAL RESEARCH LABORATORY
WATER QUALITY CONTROL RESEARCH PROGRAM
GROUND WATER POLLUTION RESEARCH PROGRAM
TREATMENT AND CONTROL RESEARCH PROGRAM
GULF BREEZE ENVIRONMENTAL RESEARCH LABORATORY
SOUTHEAST ENVIRONMENTAL RESEARCH LABORATORY
INDUSTRIAL AND AGRICULTURAL POLLUTION CONTROL RESEARCH PROGRAM
WATER CONTAMINANTS CHARACTERIZATION RESEARCH PROGRAM
POLLUTION FATE RESEARCH PROGRAM

FIGURE B-4

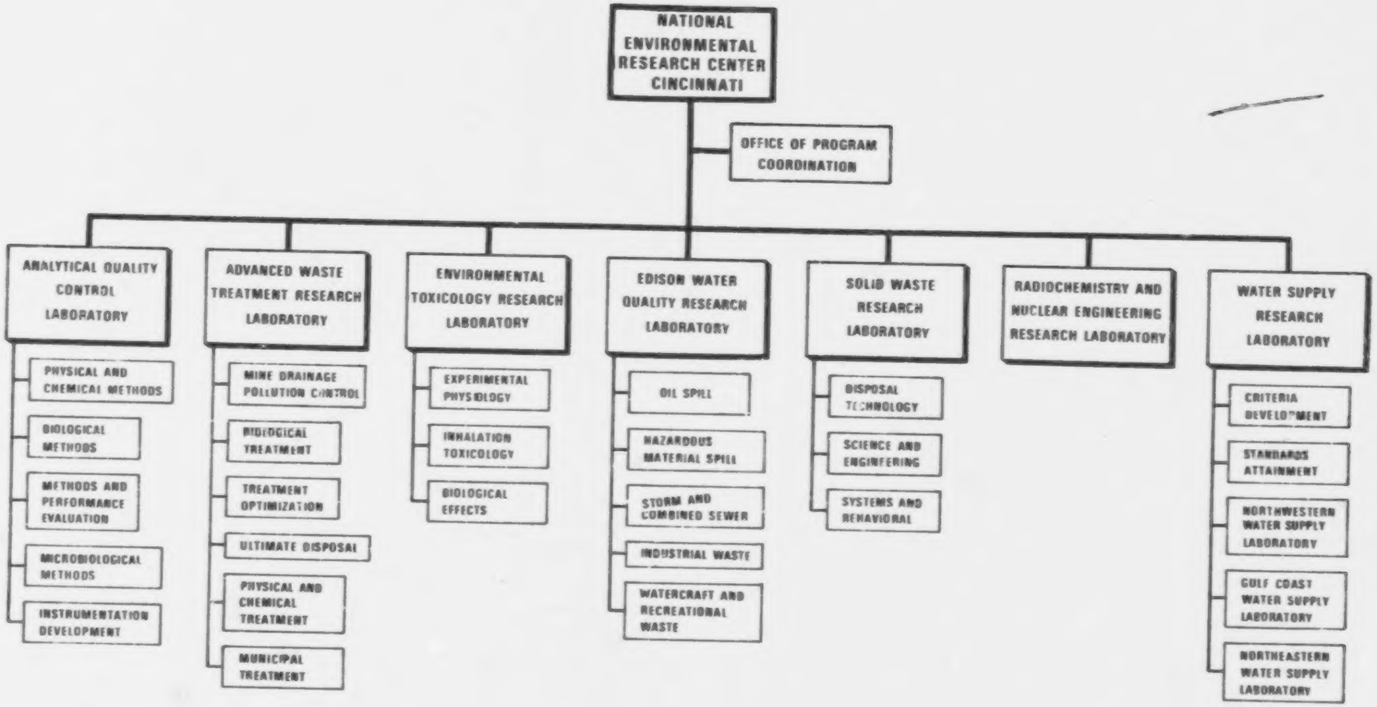
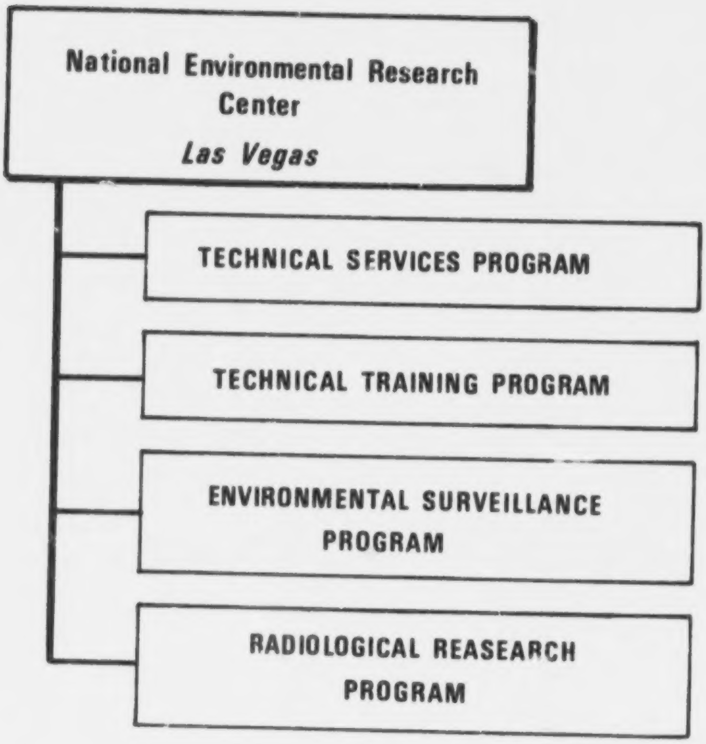

NATIONAL ENVIRONMENTAL RESEARCH CENTER CINCINNATI
OFFICE OF PROGRAM COORDINATION
ANALYTICAL QUALITY CONTROL LABORATORY
PHYSICAL AND CHEMICAL METHODS
BIOLOGICAL METHODS
METHODS AND PERFORMANCE EVALUATION
MICROBIOLOGICAL METHODS
INSTRUMENTATION DEVELOPMENT
ADVANCED WASTE TREATMENT RESEARCH LABORATORY
MINE DRAINAGE POLLUTION CONTROL
BIOLOGICAL TREATMENT
TREATMENT OPTIMIZATION
ULTIMATE DISPOSAL
PHYSICAL AND CHEMICAL TREATMENT
MUNICIPAL TREATMENT
ENVIRONMENTAL TOXICOLOGY RESEARCH LABORATORY
EXPERIMENTAL PHYSIOLOGY
INHALATION TOXICOLOGY
BIOLOGICAL EFFECTS
EDISON WATER QUALITY RESEARCH LABORATORY
OIL SPILL
HAZARDOUS MATERIAL SPILL
STORM AND COMBINED SEWER
INDUSTRIAL WASTE
WATERCRAFT AND RECREATIONAL WASTE
SOLID WASTE RESEARCH LABORATORY
DISPOSAL TECHNOLOGY
SCIENCE AND ENGINEERING
SYSTEMS AND BEHAVIORAL
RADIOCHEMISTRY AND NUCLEAR ENGINEERING RESEARCH LABORATORY
WATER SUPPLY RESEARCH LABORATORY
CRITERIA DEVELOPMENT
STANDARDS ATTAINMENT
NORTHWESTERN WATER SUPPLY LABORATORY
GULF COAST WATER SUPPLY LABORATORY
NORTHEASTERN WATER SUPPLY LABORATORY

FIGURE B-5


National Environmental Research Center
Las Vegas
TECHNICAL SERVICES PROGRAM
TECHNICAL TRAINING PROGRAM
ENVIRONMENTAL SURVEILLANCE PROGRAM
RADIOLOGICAL REASEARCH PROGRAM

APPENDIX C

REGIONAL RESEARCH AND MONITORING REPRESENTATIVES

ORGANIZATION	NAME	ADDRESS	TELEPHONE
Region I Connecticut Maine Massachusetts New Hampshire Vermont	Mr. Allyn Richardson	John F. Kennedy Building Room 2303 Boston, Massachusetts 02203	(617) 223–3477
Region II Delaware New Jersey New York Puerto Rico	Dr. Robert W. Mason	26 Federal Plaza Room 845-C New York, New York 10C07	(212) 264–3100

Region III Maryland Pennsylvania West Virginia Virginia	Mr. Ralph Rhodes	Curtis Building 6th and Walnut Streets Philadelphia, Pennsylvania 19106	(215) 597–9856
Region IV Alabama Florida Georgia Kentucky Mississippi North Carolina South Carolina Tennessee	Mr. Edmond Lomasney	1421 Peachtree Street, N.E. Suite 300 Atlanta, Georgia 30309	(404) 526–3229
Region V Illinois Indiana Michigan Minnesota Ohio Wisconsin	Mr. Clifford Risley,Jr	One North Wacker Drive Chicago, Illinois 60606	(312) 353–5756

Region VI Arkansas Louisiana New Mexico Oklahoma Texas	Dr. Richard L. Hill	1600 Patterson Suite 1100 Dallas, Texas 75201	(214) 749–1461
Region VII Iowa Kansas Missouri Nebraska	Dr. William Garner	TWA Building 1735 Baltimore Room 249 Kansas City, Missouri 64108	(816) 374–5736
Region VIII Colorado Montana North Dakota South Dakota Utah Wyoming	Mr. Russell W. Fitch	1860 Lincoln Street Suite 900 Denver, Colorado 80203	(303) 837–3760

Region IX Arizona California Hawaii Nevada	Mr. Vern Tenney	100 California Street San Francisco, California 94111	(415) 556–6506
Region X Alaska Idaho Oregon Washington	Mr. William Clothier	1200 6th Avenue Seattle, Washington 98101	(206) 442–1296

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